Five-Year Review Report

Fourth Five-Year Review Report
for
Tri-City Disposal Co.
KYD981028350

Brooks
Bullitt County, Kentucky

April 2013

United States Environmental Protection Agency
Region 4
Atlanta, Georgia

Approved by:

Franklin E. Hill
Director, Superfund Division

Date: 4/30/13

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for
Tri-City Disposal Co.
Route 1526 at the Gravel Road
Brooks
Bullitt County, Kentucky

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List of Acronyms

AECOM	AECOM Technical Services, Inc.
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-DCE	Cis-1,2-Dichloroethene
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
CSF	Cancer Slope Factor
DAF	Dilution Attenuation Factor
DCE	1,2-Dichloroethane
Ebasco	Ebasco Services, Inc.
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
ft bgs	Feet Below Ground Surface
FYR	Five-Year Review
IC	Institutional Control
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk Factors
KDEP	Kentucky Department of Environmental Protection
KNREPC	Kentucky Natural Resources and Environmental Protection Cabinet
KRS	Kentucky Revised Statutes
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
µg/kg	Micrograms Per Kilogram
µg/L	Micrograms Per Liter
MW	Monitoring Well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PPB	Parts Per Billion
PPT	Parts Per Trillion
PRG	Preliminary Remediation Goals
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RD/RA	Remedial Design and Remedial Action
RfC	Inhalation Reference Concentrations
RfD	Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
RUST	RUST Environmental and Infrastructure

SSL	Soil Screening Level
SVOC	Semi-volatile Organic Compound
TBC	To-Be-Considered
TCE	Trichloroethene
TCDD	2,3,7,8-tetrachlorodibenzodioxin
TEF	Toxic Equivalent Factors
TEQ	Toxic Equivelant Concentrations
THM	Trihalomethane
trans-DCE	Trans-1,2-Dichloroethene
UAO	Unilateral Administrative Order
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

Executive Summary

Introduction

The Tri-City Disposal Superfund Site (the Site) is located in the community of Brooks in north-central Bullitt County, Kentucky, about 15 miles south of Louisville and four miles west of U.S. Interstate 65 in a rural residential and agricultural area. The Site includes several properties: a former disposal area and the properties surrounding it, owned by multiple parties on the south side of State Highway 1526 (also known as Brooks Hill Road).

Tri-City Industrial Services, Inc. operated an industrial waste landfill on site from 1964 until 1967. Waste disposed of at the Site included scrap lumber and fiberglass insulation, as well as drummed liquid wastes and bulk liquids. Liquid waste included paint thinners and other volatile liquids containing polychlorinated biphenyls (PCBs), phenols, heavy metals and volatile organic compounds (VOCs). The former disposal area was the source for both soil and ground water contamination at the Site.

In 1988, the United States Environmental Protection Agency conducted an emergency removal action to provide residents with potable water and excavate and remove 165 drums, additional crushed and empty drums, metal containers of various sizes, auto parts, 400 gallons of free liquids, and over 800 cubic yards of contaminated soil.

Selected Remedy

Two operable units (OUs) were defined for the Site. OU1 addressed contamination in sediment, surface water, ground water, and soils known at the time of the Site's 1991 Record of Decision (ROD). OU2 addressed any contamination found during the confirmatory sampling of soils, sediment and ambient air.

The EPA signed the OU1 ROD to select the remedy on August 28, 1991. The 1991 ROD established remedial action objectives (RAOs), which included restoration of the ground water to its beneficial uses within a reasonable timeframe through removal of VOCs from the spring water at the Site. The RAOs also included the expectation that contaminant levels would achieve maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) in Cox Spring within 10 years of the signing of the 1991 ROD.

The 1991 ROD required attainment of cleanup goals for ground water to address human health concerns and protect ground water resources at the Site. The selected remedy consisted of the following remedial components:

- Placing institutional controls on the Site to restrict use of ground water containing, or potentially containing, levels of contamination in excess of MCLs or MCLGs until monitoring indicates that the water is reliably safe for human consumption.
- Continuing to provide potable water to residents who previously used contaminated ground water as a source of potable water until the EPA, through monitoring, determines that the water is of sufficient and consistent quality for human consumption.
- Long-term monitoring of ground water, on-site springs, surface water and sediment for up to 30 years.

- Confirmatory sampling to assess the efficacy of the emergency removal action and the extent of contamination in other media.
- Treating surface water from Cox Spring with carbon adsorption until the spring achieves MCLs, which was initially expected to take 10 years.

The EPA revised the remedy selected in the 1991 ROD in a 2012 Explanation of Significant Differences (ESD) that documented the following modifications to the remedy:

- Removing ground water restrictions on three residential properties upgradient of the known disposal areas at the Site that have been connected to the public water supply.
- Ending carbon treatment of the Cox Spring and Unnamed Spring #1.
- Requiring the addition of 12 inches of soil cover to a 1-acre portion of the Site to add greater physical separation between residual soil contaminants and the ground surface.

The EPA signed the OU2 ROD on March 29, 1996. The 1996 ROD indicated that previous response actions at the Site, including emergency removal and treatment of contaminated ground water, appear to have eliminated the need for additional remedial action. The decision for no further action for OU2 was not expected to result in hazardous substance remaining on-site above health-based levels.

Technical Assessment

The review of decision documents and applicable or relevant and appropriate requirements (ARARs) and the results of the site inspection indicate that the Site's remedy is functioning as intended by site decision documents. Residents are connected to the public water supply and no one is currently using any ground or spring water at the Site. In addition, institutional controls are in place to prevent future ground water and spring water use.

There have been fluctuations and exceedances of MCLs in concentrations of tetrachloroethene (PCE) and trichloroethene (TCE) at the Site during the previous five years. During review of the Site's revised O&M Plan, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.

The EPA decision for no further action for OU2 was not expected to result in hazardous substance remaining on site above health-based levels. However, additional surface and subsurface soil samples in 2001 and 2002 indicated subsurface soil remained at the Site that could present a risk to area residents if the surface soil is disturbed. However, soil cover and institutional controls ensure that there are no current completed exposure pathways. The site decision documents did not indicate soil and land use controls were required to prevent unacceptable risk to human health. The EPA reviewed the data and concurred with the findings of Earth Tech and the Kentucky Department of Environmental Protection that restrictive covenants and institutional controls for land use should remain in place.

There have been no significant changes to the exposure assumptions since the time of remedy selection that affect protectiveness at the Site. The results of the Site's 2008 focused risk assessment support the conclusion that the Site's remedy remains protective of human health and the environment, as does the 2009 vapor intrusion risk evaluation, and the additional multiple lines of evidence vapor intrusion evaluation conducted as part of this five-year review (FYR).

However, due to significant changes in toxicity values for dioxin, the EPA may want to consider adoption of a site cleanup standard for dioxin.

Conclusion

The remedy at OU1 is protective of human health and the environment. Affected residents remain connected to the public water supply, the use of spring water and ground water at the Site remains restricted by institutional controls, and long-term monitoring is ongoing. However, to ensure long-term protectiveness, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.

The remedy at OU2 is protective of human health and the environment. Additional soil cover has been added to the impacted soil area to add a greater physical separation between residual soil contaminants. Ground surface and institutional controls have been implemented to restrict land uses to appropriate uses.

The remedy at the Site is currently protective of human health and the environment in the short term. Exposure pathways that could result in unacceptable risks are being controlled. However, to ensure protectiveness in the long term, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Tri-City Disposal Co.		
EPA ID: KYD981028350		
Region: 4	**State:** KY	**City/County:** Brooks/Bullitt County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Treat Suomi and Lynette Wysocki (Reviewed by EPA)		
Author affiliation: Skeo Solutions		
Review period: September 2012 – April 2013		
Date of site inspection: 9/19/2012		
Type of review: Statutory		
Review number: 4		
Triggering action date: 4/29/2008		
Due date *(five years after triggering action date)*: 4/29/2013		

Five-Year Review Summary Form (continued)

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
OU2				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: There have been fluctuations and exceedances of MCLs in concentrations of PCE and TCE at the Site during the past five years.			
	Recommendation: During review of the revised O&M Plan, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	4/30/2014

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy at OU1 is protective of human health and the environment. Affected residents remain connected to the public water supply, the use of spring water and ground water at the Site remains restricted by institutional controls, and long-term monitoring is ongoing. However, to ensure long-term protectiveness, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.		
Operable Unit: OU2	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy at OU2 is protective of human health and the environment. Additional soil cover has been added to the impacted soil area to add a greater physical separation between residual soil contaminants. Ground surface and institutional controls have been implemented to restrict land uses to appropriate uses.		
Sitewide Protectiveness Statement (if applicable)		
Protectiveness Determination: Short-term Protective		*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy at the Site is currently protective of human health and the environment in the short term. Exposure pathways that could result in unacceptable risks are being controlled.		

However, to ensure protectiveness in the long term, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.

Five-Year Review Summary Form (continued)

Environmental Indicators
- Current human exposures at the Site are under control. - Current ground water migration is under control.

Are Necessary Institutional Controls in Place?
☒ All ☐ Some ☐ None

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☐ Yes ☒ No

Has the Site Been Put into Reuse?
☒ Yes ☐ No

Fourth Five-Year Review Report
for
Tri-City Disposal Co. Superfund Site

1.0 Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

Skeo Solutions, an EPA Region 4 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Tri-City Disposal Co. Superfund Site (the Site) in Brooks, Bullitt County, Kentucky. The EPA's contractor conducted this FYR from September 2012 to April 2013. The EPA is the lead agency for developing and implementing the remedy for the potentially responsible party (PRP)-financed cleanup at the Site. The Kentucky Department of Environmental Protection (KDEP; formerly the Kentucky Natural Resources and Environmental Protection Cabinet, or KNREPC), as the support agency representing the State of Kentucky, has reviewed all supporting documentation and provided input to the EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this statutory review is the previous FYR. The FYR is required because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of two operable units (OUs). OU1 addressed site contamination and the remedy documented in the Site's 1991 Record of Decision (ROD). The EPA defined OU2 to address any contamination found during confirmatory sampling of site soil, sediment and ambient air.

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
Industrial waste landfill operated on site	1964 to 1967
Lawsuit filed against the landfill and its owners results in landfill closure	November 1967
KNREPC completed preliminary site assessment	September 11, 1985
KNREPC completed site investigation	April 1987
EPA conducted additional site investigations and provided local residents with drinking water	May 1988
EPA initiated removal actions to stabilize the Site	May 12, 1988
EPA conducted an additional study to assess Site's potential impact on area residents from ground water, dust and direct contact	June 1988
EPA proposed the Site for listing on National Priorities List (NPL)	June 24, 1988
EPA conducted an emergency removal action	August and September 1988
EPA began remedial investigation/feasibility study (RI/FS)	February 7, 1989
EPA finalized Site on NPL	March 31, 1989
EPA completed ecological and health risk assessments	August 15, 1990
EPA completed RI/FS EPA signed ROD for OU1	August 28, 1991
EPA completed removal assessment	September 3, 1991
EPA issued Unilateral Administrative Order (UAO)	March 16, 1992
PRPs began remedial design	March 31, 1992
PRPs submitted the remedial design work plan	August 1992
EPA completed removal actions to stabilize the Site	September 30, 1992
PRPs submitted Remedial Design Report for OU1	May 1993
PRPs completed remedial design PRPs began remedial action	June 22, 1993
PRPs submitted Remedial Action Work Plan	September 1993
PRPs submitted Remedial Design Report for Unnamed Spring #1	March 1994
PRPs submitted Operation and Maintenance (O&M) Plan	November 1994
PRPs submitted Final Construction Report	November 1994
PRPs began long-term response action	April 1, 1995
EPA conducted pre-certification inspection	May 1995
PRPs completed remedial action	September 11, 1995
Cox residences connected to public water system	1995
EPA approved Final Construction Inspection Report	March 1996
EPA issued Remedial Action Close-Out Report EPA signed No Further Action ROD for OU2	March 29, 1996
EPA and PRPs signed Consent Decree	October 30, 1997
EPA signed first FYR	April 3, 1998
PRPs constructed Klapper Spring remediation system (fencing)	May 1998
PRPs installed lightning protection at treatment control building	December 2000
KDEP requested additional soil sampling	December 11, 2000
Float switch installed at Cox Spring treatment system to fix problem noticed in summer of 2000	January 2001
KDEP and PRPs met to discuss additional sampling	April 26, 2001
KDEP conducted additional soil sampling	December 2001
KDEP conducted additional soil sampling	March 2002
Klapper residences connected to public water supply	May 2002

Event	Date
EPA signed second FYR	April 29, 2003
PRPs conducted additional surface water sampling	2006
PRPs finalized focused risk assessment	January 2008
EPA signed third FYR	April 29, 2008
PRPs conducted screening level vapor intrusion assessment	July 30, 2009
PRPs filed institutional controls with Bullitt County	January 20, 2010
PRPs suspended carbon treatment PRPs conducted additional surface water sampling	April 2010
PRPs filed additional institutional controls with Bullitt County	April 5, 2010
EPA signed Explanation of Significant Differences (ESD)	March 13, 2012
PRPs filed remaining institutional controls with Bullitt County	August 14, 2012
PRPs conducted additional remedial action construction	May 2012
PRPs submitted Construction Documentation Report	July 2012

3.0 Background

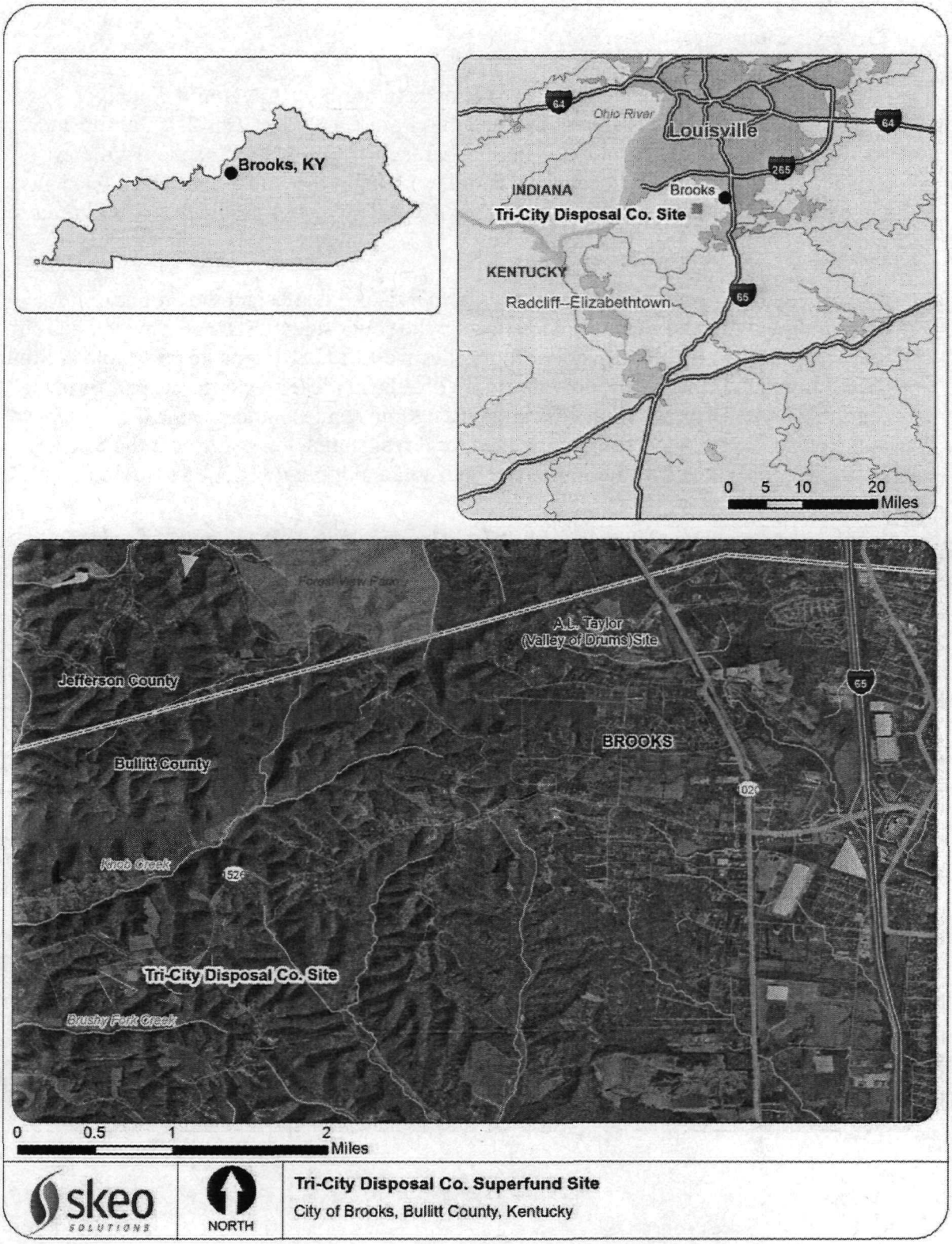
3.1 Physical Characteristics

The Site is located in the community of Brooks in north-central Bullitt County, Kentucky, about 15 miles south of Louisville (Figure 1). CERCLIS lists the site address as "Route 1526 at the gravel road" in Shepherdsville, Kentucky. Shepherdsville is a slightly larger community located seven miles south of the Site. All affected residents have addresses on Klapper Road in Brooks, Kentucky; therefore, this FYR will refer to the Site's location as Brooks, Kentucky.

The Site includes several properties: the former disposal area and the properties surrounding it, owned by multiple parties on the south side of State Highway 1526 (also known as Brooks Hill Road), about four miles west of U.S. Interstate 65 (Table 2, Figure 2). Section 6.4 of this report provides more details on these properties as part of the section's review of institutional controls. Longtime residents include the Cox, Klapper and Hoosier families. Sparsely populated rural residential areas surround the Site. The former disposal area was the source for both soil and ground water contamination at the Site.

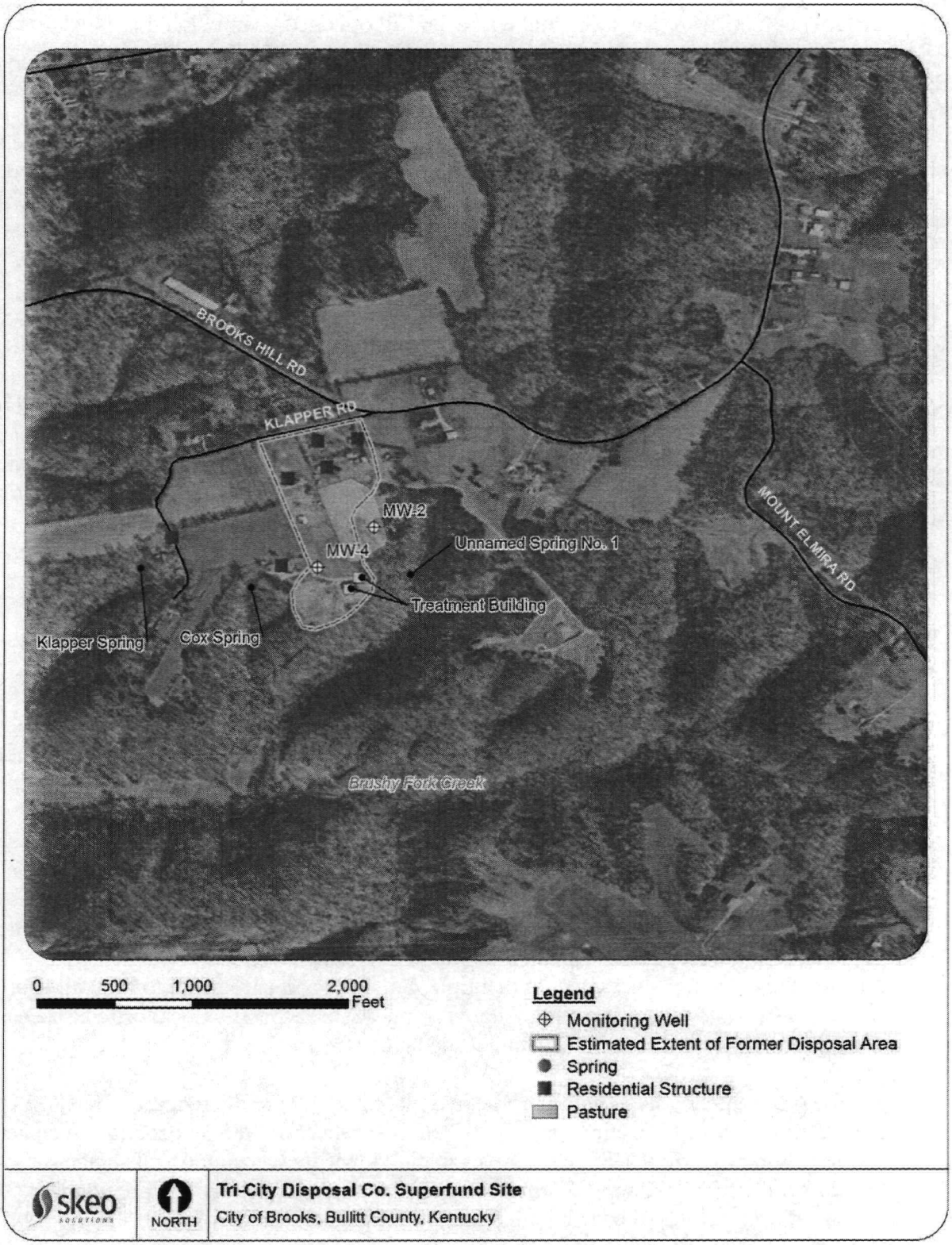
The Site is located within the Outer Bluegrass physiographic region of Kentucky, which contains many deep valleys caused by interbedded limestones and shales. The Site contains several springs and seeps that emerge from the fractured shales and run down the valleys, but which are also prone to dry periods. Ground water flows through interconnected fractures, bedding planes and dissolution pathways. Movement of ground water occurs primarily to the south-southwest, along bedding planes. Ground water discharges through springs and seeps located on the south and west sides of the Site. Forested land containing Brushy Fork Creek and several springs surround the Site on two sides. The Site does not contain any wetlands or endangered species and is not considered an environmentally sensitive area.

Figure 1: Site Location Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure 2: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

3.2 Land and Resource Use

From 1964 until 1967, an industrial waste landfill operated on site. Land uses surrounding the Site include forested and agricultural areas and low-density residential areas. The Site is located on top of a ridge (locally referred to as Brooks Hill) used for farming, grazing and rural residential activities. Land use at and near the Site has remained the same over the past 20 years and no substantial changes to its current use are anticipated. The Cox family currently owns the majority of the Site and maintains two residences on their property as well as a recently constructed metal barn. Additionally, several residences are located adjacent to the Site to the north and west. Residents use portions of their properties for vegetable gardening, animal pastures and recreation.

Residences near the Site formerly used the Brushy Fork Creek, located in the valley south of the ridge, and three springs that emanate from the side of the ridge south of the Site as drinking water sources. Private ground water wells do not provide domestic water to homes on or near the Site because the bedrock generally does not yield adequate water supplies. Brushy Fork Creek and the three springs are not drinking water sources because the Louisville Water Company currently provides connection to the public water supply system for all potentially affected properties at or near the Site. The Commonwealth of Kentucky classified the aquifer under the Site as a Class II-B aquifer, a resource that should be maintained at drinking water quality levels. In addition, no public drinking water supply wells are located near or downgradient of the Site.

3.3 History of Contamination

Tri-City Industrial Services, Inc. operated an industrial waste landfill on site from 1964 until 1967. Waste disposed of at the Site included scrap lumber and fiberglass insulation, as well as drummed liquid wastes and bulk liquids. Liquid waste included paint thinners and other volatile liquids containing polychlorinated biphenyls (PCBs), phenols, heavy metals and volatile organic compounds (VOCs).

During landfill operations, citizens filed numerous complaints concerning odors, fires, explosions, deposition of ash on adjoining properties, eye irritation and breathing difficulties. Complaints led to a public nuisance lawsuit and Tri-City Industrial Services, Inc. and others were served with an indictment in November 1967. Local officials arrested the company's president at that time. Following an agreement to drop all charges if the company stopped disposing of and burning waste at the Site, local officials released Mr. Kletter. The lawsuit led to closure of the landfill in 1967.

The EPA became involved with the Site in September 1985 at the request of KNREPC. KNREPC conducted a preliminary assessment in September 1985 and conducted a site investigation in April 1987. The site investigation identified hazardous substances in soil and contamination in Klapper Spring. Klapper Spring contained tetrachloroethene (PCE) at concentrations that exceeded the federal drinking water standards. In 1988, the EPA conducted a survey of potable water sources within a half-mile radius of the Site. This

survey again showed PCE in Klapper Spring and elevated levels of PCE and trichloroethene (TCE) in Cox Spring.

3.4 Initial Response

The EPA started supplying potable water to affected residents in May 1988 to prevent the use of the contaminated springs. In August and September 1988, the EPA conducted an emergency removal action in an area immediately south of the Cox, Sr. residence to address the "black ooze" emanating from the side yard. The EPA identified xylene, toluene, ethylbenzene and lead in the substance. The EPA then conducted geophysical surveys and field analytical screenings and found that waste disposal was concentrated on the southern half of the Site. The EPA activities included excavating and removing 165 drums, additional crushed and empty drums, metal containers of various sizes, auto parts, 400 gallons of free liquids, and over 800 cubic yards of contaminated soil. The EPA identified contaminated soils through geophysical surveys and test trenches, which the EPA excavated in areas with geophysical anomalies. Soil in these trenches contained empty drums, drums containing solids, fiberglass insulation, wires and ash.

The EPA proposed the site for listing on the National Priorities List (NPL) in 1988. In November 1988 and May 1989, the EPA identified Tri-City Industrial Services, Inc. and those companies who sent waste to the Site for disposal as the PRPs for the Site. The EPA notified the PRPs via special notice letters and gave the PRPs the opportunity to conduct a remedial investigation/feasibility study (RI/FS) under EPA oversight. However, none of the PRPs elected to undertake these activities. In 1989, the EPA finalized the Site on the NPL. In 1992, a Unilateral Administrative Order (UAO) directed three of the PRPs, Waste Management of Kentucky, Inc., Dow Corning and Ford Motor Company, to fund and implement cleanup activities at the Site. The PRPs are not landowners at the Site, but they continue to fund the implementation of the remedial action.

3.5 Basis for Taking Action

The EPA began an RI/FS in 1989 and completed it in 1991. Additionally, Ebasco Services, Inc. (Ebasco) conducted a risk assessment in 1990 under EPA oversight. The 1990 risk assessment represented the original basis for action at the Site, identifying ground water as the primary medium of concern due to its use as a drinking water source. Contaminants identified in ground water included VOCs, including PCE and TCE, and vinyl chloride. PCE, TCE and vinyl chloride occurred in ground water both on site and off site at levels that exceeded the EPA's existing or proposed maximum contaminant levels (MCLs). The majority of the risk at the Site resulted from exceedances of the MCL for vinyl chloride. The EPA considered inhalation and ingestion of surface water and ground water future pathways of concern. The risks associated with ground water contamination at the Site primarily included an increased risk of cancer and liver disease due to inhalation or ingestion of VOC-contaminated ground water.

The 1990 risk assessment identified the primary human receptors as the four families living near the Site at the time of its discovery. The risk assessment indicated a potential health risk associated with raising beef cattle and cultivating gardens on site. However, the risk assessment based the potential risk on the detection of contaminants in one out of the 20 on-site surface soil samples collected. Due to the low frequency of detection, the EPA recommended verification of the presence of surface soil contamination. Confirmatory sampling of site soil, sediment and ambient air did not identify contamination at levels requiring cleanup.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria are:

1. Overall Protection of Human Health and the Environment.
2. Compliance with ARARs.
3. Long-Term Effectiveness and Permanence.
4. Reduction of Toxicity, Mobility or Volume through Treatment.
5. Short-term Effectiveness.
6. Implementability.
7. Cost.
8. State Acceptance.
9. Community Acceptance.

4.1 Remedy Selection and Implementation

Based on the results of the original RI/FS and to expedite action, the EPA divided the Site into two OUs. OU1 included remediation of contaminated ground water and confirmatory sampling to identify any unacceptable contaminant concentrations in areas of the property not previously addressed. The EPA defined OU2 to address any contamination found during the confirmatory sampling of site soil, sediment and ambient air.

OU1 and OU2 RODs

The EPA signed the OU1 ROD to select the Site's remedy on August 28, 1991. The 1991 ROD established remedial action objectives (RAOs), which included restoration of the ground water to its beneficial uses within a reasonable timeframe through removal of VOCs from the spring water at the Site. The RAOs also included the expectation that contaminant levels would achieve MCLs and maximum contaminant level goals (MCLGs) in Cox Spring within 10 years of the signing of the 1991 ROD.

The 1991 ROD required attainment of cleanup goals for ground water to address human health concerns and protect ground water resources at the Site. The selected remedy in the 1991 ROD required treatment of contaminated ground water to MCLs and non-zero MCLGs in order to reduce carcinogenic risk to 1.4×10^{-4} or below and to reduce the Hazard Quotient to less than one. The selected remedy consisted of the following remedial components:

- Placing institutional controls on the Site to restrict use of ground water containing, or potentially containing, levels of contamination in excess of MCLs

or MCLGs until monitoring indicates that the water is reliably safe for human consumption.

- Continuing to provide potable water to residents who previously used contaminated ground water as a source of potable water until the EPA, through monitoring, determines that the water is of sufficient and consistent quality for human consumption.
- Long-term monitoring of ground water, on-site springs, surface water and sediment for up to 30 years.
- Confirmatory sampling to assess the efficacy of the emergency removal action and the extent of contamination in other media.
- Treating surface water from Cox Spring with carbon adsorption until the spring achieves MCLs, which was initially expected to take 10 years.

The Commonwealth of Kentucky generally concurred with the selected remedy, but maintained that Kentucky Revised Statutes (KRS) 224.877 is a state ARAR that is more stringent than federal standards. The Commonwealth requested the EPA's compliance with Section 10 of this statute:

> The remedial action shall protect human health, safety, and the environment considering the following factors as appropriate: the characteristics of the pollutants, hydrogeologic features of the area, current and future uses of surface and ground water, potential effects of residual contamination, health effects and environmental consequences, an exposure assessment, and any other available information.

The EPA did not view this statute as more stringent because it lacks any enforceable numeric standards that differ from federal standards.

Table 2 lists the 1991 ROD cleanup goals for ground water and surface water contaminants of concern (COCs).

Table 2: Ground Water and Surface Water COC Cleanup Goals

COC	MCL (parts per billion, or ppb)	MCLG (ppb)
Chloroform	100	--
1,1-Dicholorethene	7	7
Cis-1,2-Dichloroethene (cis-DCE)	70	70
Trans-1,2-Dichloroethene (trans-DCE)	100	100
PCE	5	0
Toluene	1,000	1,000
1,1,1-Trichloroethane	200	200
TCE	5	0
Vinyl Chloride	2	0
Xylenes	10,000	10,000
Bis(2-Ethylhexyl)Phthalate	4*	0*
* Indicates a proposed MCL or MCLG. -- Indicates a MCL or MCLG has not been established.		

Remedial design for the remedy selected in the OU1 1991 ROD began in March 1992, and was completed by June 1993.

In March 1992, three site PRPs, Waste Management of Kentucky, Inc., Dow Corning, and Ford Motor Company, agreed to implement the remedial design and remedial action (RD/RA) required by the OU1 ROD under a UAO. Under a contract with the PRPs, contractor RUST Environmental and Infrastructure (now AECOM Technical Services, Inc. (AECOM)) began the RD/RA activities in November 1992. The EPA and state officials reviewed and inspected the various phases of the work. The PRPs initiated long-term monitoring of ground water, surface water, sediment and ecology for site-related impacts. In addition, the PRPs conducted performance standards field sampling for baseline data and management of ground water treatment. The PRPs also completed confirmatory sampling required by the OU1 ROD.

Long-term monitoring began in 1993 in accordance with the 1992 field sampling plan. The plan called for long-term monitoring of five springs and six ground water monitoring wells, as well as ecological monitoring of surface water, sediment and toxicity. At the time, Cox Spring, Unnamed Spring #1 and Klapper Spring were undergoing remediation and were not included in the long-term monitoring program.

- *Brading Spring No. 2* – Samples were collected from 1992 through 1998. There were no exceedances of the MCLs or non-zero MCLGs from 1994 to 1998. As a result, long-term monitoring was discontinued.
- *Cattle Spring* – Samples were collected according to the long-term monitoring. program from 1992 through 1998. Since no exceedances of the MCLs or non-zero MCLGs were recorded, long-term monitoring was discontinued.
- *Abandoned Monitoring Wells* – Ground water samples were collected from six ground water monitoring wells at the Site. Monitoring well (MW)-05 had no detections that exceeded the MCLs or non-zero MCLGs through 1997, so long-

term monitoring of MW-05 was considered complete. Monitoring wells MW-08, MW-11 and MW-12 had no exceedances during the five years they were sampled. Therefore, long-term monitoring was considered complete for these wells, which were properly abandoned after the 2004 FYR, in accordance with its recommendations.

- *Active Monitoring Wells* –For monitoring wells MW-02 and MW-04, monitoring is ongoing and will continue until there have been five consecutive sampling events without an exceedance of the MCLs or non-zero MCLGs.
- *Ecological Monitoring* – Baseline ecological monitoring occurred in 1992, with additional monitoring events from 1993 through 1997. The EPA used these results to demonstrate that the Site does not have an adverse effect on the ecology of Brushy Fork Creek and subsequently approved the discontinuation of ecological monitoring.

The results of the sampling events formed the basis for the RD, which included a comprehensive equipment specification, construction layout and management plan, quality control provisions, and other components of the ground water treatment system for remediating the contaminated springs. Two site reports, the Final Remedial Design Report and Final Remedial Action Work Plan, provide details of the RD. Construction and installation of the RA facilities were completed in June 1994. This included two separate systems of flow lines, temporary holding tanks, pumps and granular activated carbon adsorption beds. The two affected springs (Cox and Unnamed Spring #1) were remediated concurrently by pumping contaminated water from each spring through the appropriate carbon adsorption system. Regular sampling of the springs monitored the progress of the remediation process. The confirmatory sampling conducted as described in the OU1 1991 ROD resulted in the EPA signing a No Action ROD for OU2 in 1996.

2008 Focused Risk Assessment

In 2006, the EPA requested that the PRPs conduct a new human health focused risk assessment for spring surface water at the Site. The PRPs finalized the new human health focused risk assessment in 2008. It only evaluated risks associated with ground water and spring surface water, and did not evaluate exposure to surface and subsurface soil, contaminants leaching from soil to ground water or vapor releases from soil or ground water. The focused risk assessment's findings included:

- PCE, TCE, vinyl chloride and 1,2-dichloroethane (DCE) were the only remaining spring water contaminants of potential concern.
- Ground water was an incomplete exposure pathway because residents at and near the Site do not use ground water for drinking water due to insufficient yield of ground water wells. Additionally, use of the ground water for drinking water is not anticipated in the future.
- VOCs volatilize from the spring water a few hundred feet downstream of the source and before the springs' confluence with Brushy Fork Creek. The 2008 focused risk assessment used a conservative spring water exposure scenario and the highest contaminant concentrations detected in the previous 10 years to

calculate the risk from intermittent and incidental ingestion, inhalation and dermal contact associated with the spring water.

- Potential exposure from intermittent and incidental ingestion, inhalation and dermal contact associated with the spring water does not exceed risk-based levels and does not pose an unacceptable risk to the health of receptors at the Site. The spring water exposure scenario was based on the assumption that local residents might contact spring water intermittently and in an incidental fashion. The assessment did not consider ingestion of significant quantities of the spring water realistic or reasonable because spring discharge occurs from relatively inaccessible, steep hillsides.

The 2008 focused risk assessment attributes changes in risk between 1991 and 2008 to the decline in VOC concentrations over the intervening 17 years and the fact that domestic uses of spring water no longer occur. Table 3 (Table 8-1 from the 2008 Focused Risk Assessment Report) illustrates COC concentrations used for the 1991 and 2008 risk assessments. The lower values used in 2008 reflect the overall decline in spring surface water VOC concentrations between 1991 and 2008.

Table 3: Maximum Detections (of COCs in Springs) Used in Risk Assessments

COC	Concentration Used in 1991 Risk Assessment	Concentration Used in 2008 Risk Assessment
DCE	280 µg/l	82 µg/l
PCE	560 µg/l	260 µg/l
TCE	47 µg/l	63 µg/l
Vinyl Chloride	32 µg/l	2.3 µg/l

2012 Explanation of Significant Differences (ESD)

In March 2012, the EPA issued an Explanation of Significant Differences (ESD). A 2008 report issued by contractor Earth Tech titled *Focus Risk Assessment of Potential Exposures to Volatile Organic Compounds Detected in Spring Water* and a 2010 study conducted by AECOM, which reconfirmed the findings of the 2008 report, served as the basis for the ESD. The EPA and KDEP reviewed the report and study and concurred with the results and conclusions. The 2012 ESD documented the following modifications to the remedy at OU1, selected in the 1991 ROD, and the no further action remedy selected for OU2:

- Removing ground water restrictions on three residential properties (the Cox Property, the Leedy Property and the Stilger/Leedy Property) at the Site that are upgradient of the known disposal areas at the Site and have been connected to the public water supply.
- Ending carbon treatment of the Cox Spring and Unnamed Spring #1.
- Requires the addition of 12 inches of soil cover to a 1-acre portion of the Site to add greater physical separation between residual soil contaminants and the ground surface.

Completion of the additional soil cover called for in the 2012 ESD was documented in July 2012. The work documented included the following activities:

- Site preparations (e.g., staking, mowing, clearing and erosion control).
- Removal and disposal of waste materials in the pasture area (e.g., appliances, scrap metal and an old automobile).
- Ravine improvements.
- Stormwater management improvements.
- Protective earth cover and site grading.
- Seeding and site restoration.
- Fence installation.
- Soil testing.

Implementation of Institutional Controls
Institutional controls have been implemented in the form of various covenants restricting the use of certain property parcels at the Site. Such restrictive covenants preclude ground water use, spring water use, soil disturbance, residential use and agricultural use as appropriate for each property parcel. Section 6.3 discusses the institutional controls in greater detail.

4.2 Operation and Maintenance (O&M)

A copy of the Site's O&M Plan was requested for review during the current FYR. While trying to locate the plan, it was discovered that it had not been revised since 1994 and does not reflect current activities at the Site, as reflected in the 2012 ESD. The PRPs' O&M contractor, AECOM, is currently updating the O&M Plan. A draft of the updated and revised O&M Plan was provided to the EPA in early 2013. The EPA and KDEP are currently reviewing the plan. Current O&M activities at the Site include:

- Performing semi-annual on-site inspections.
- Monitoring the water at Cox Spring and Unnamed Spring #1 on a semi-annual basis. Carbon treatment has been discontinued. This monitoring includes obtaining grab samples of the spring water for analysis of 10 of the 11 COCs. The treatment building also remains at the Site, although it is unused.

The 1991 ROD estimated annual O&M costs to include:

- Process monitoring at $23,896 per year.
- Long-term monitoring costs of $40,014 per year.
- Potable water supply costs of $2,420 per year.

O&M costs incurred at the Site during the past five years are included in Table 4. The high costs in 2012 are associated with the capping project competed in accordance with the ESD. The cost of the capping project was $113,380.

Table 4: Annual O&M Costs

Year	Total Cost
2008	$54,930
2009	$120,190
2010	$80,650
2011	$80,780
2012	$191,250
Total	**$527,800**

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2008 FYR for the Site stated:

"The remedy at the Tri-City Disposal Site currently protects human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. The assessment carried out for this FYR found that the remedy has been implemented in accordance with the requirements set forth in the Site's 1991 ROD, with the exception of ICs. The remedy is protective of human health and the environment in the short term because of the treatment and monitoring of ground water at the Cox Spring and Unnamed Spring No. 1, access restrictions on the Klapper Spring, provision of families with access to the public water supply, and continued monitoring of VOC contamination at the Site. The surface soils do not appear to be a source of concern, the springs are not being used for drinking water, and the site owners and neighbors are informed about the Site.

However, sampling indicates that VOCs persist in the two active monitoring wells and three affected springs. In order for the remedy to be protective in the long term, the contaminated spring water will need to be monitored and treated until it achieves ground water cleanup goals established in the ROD or until the PRPs new Focused Risk Assessment can be used to support that the spring water does not present a threat to human health or the environment. In addition, ICs to restrict use of ground water will need to be implemented and a screening level vapor intrusion assessment will need to be conducted to determine whether this potential pathway presents an unacceptable risk to human health. Soil sampling indicates the presence of residual contamination in subsurface soils. In order to ensure long term protectiveness, the residual subsurface soil contamination should be evaluated and appropriate action should be taken. If ICs are pursued to require land use restrictions on excavation and construction at the Site because there is contamination that does not allow for unlimited use or unrestricted exposure, specific soil concentration levels should be developed to indicate the threshold levels that would require IC restrictions on excavation and construction at the Site. EPA should follow appropriate guidelines for selecting and implementing ICs for soils since there are currently none required in the ROD. Since no remedial action was completed for OU2, the protectiveness statement for OU1 is also the site-wide protectiveness statement."

The 2008 FYR included four issues and recommendations. This report summarizes each recommendation and its current status below.

Table 5: Progress on Recommendations from the 2008 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Design and implement institutional controls for spring water and ground water as soon as possible.	PRP and EPA	09/30/2009	Complete. The EPA issued an ESD that removed the requirement for ground water restrictions at three properties. Environmental covenants were filed with Bullitt County for other properties requiring institutional controls.	03/13/2012
Implement land use Institutional controls and educate residents on their rights, responsibilities, and the risks associated with subsurface soil contamination left in place. If institutional controls are pursued to require land use restrictions on excavation and construction, specific soil concentrations should be developed that indicate the threshold concentrations for residual soils that would require institutional control restrictions. The EPA should follow appropriate guidelines for selecting and implementing institutional controls for soil, as there are currently none required in the ROD.	PRP	09/30/2009	Complete. Environmental covenants were filed with Bullitt County for properties determined by the PRPs to need land use institutional controls.	06/25/2010
Consider conducting additional soil sampling to evaluate whether there is a continuing source of contamination in the Site's soils. Continue to conduct required O&M and long-term monitoring or accept the new PRP Focused Risk Assessment.	PRP	09/30/2009	Complete. Recent ground water concentrations of COCs have started to decline and additional soil sampling was not pursued. The 2008 focused risk assessment was accepted as part of the 2012 ESD.	03/13/2012

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Conduct a screening level vapor intrusion assessment, evaluate results and if results indicate an unacceptable risk, assess and perform remediation to address this risk.	PRP	12/31/2008	Complete. Soil vapor sampling was conducted in June 2009. A soil vapor sampling summary report was submitted to the EPA on July 30, 2009. The EPA reviewed the report on August 17, 2009, and concluded that vapor intrusion was not an issue at the Cox residence.	08/17/2009

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated the FYR in June 2012 and scheduled its completion for April 2013. The remedial project manager (RPM) William Joyner led the EPA site review team, which also included the EPA community involvement coordinator (CIC) Angela Miller and contractor support provided to the EPA by Skeo Solutions. In October 2012, the EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In September 2012, the EPA published a public notice in the *Pioneer News* newspaper announcing the commencement of the FYR process for the Site, providing contact information for CIC Angela Miller and EPA RPM Bill Joyner and inviting community participation. The press notice is available in Appendix B. No one contacted the EPA as a result of the advertisement.

The EPA will make the final FYR Report available to the public. Upon completion of the FYR, the EPA will place copies of the document in the designated site repository, Ridgeway Memorial Library, located at 127 Walnut Street, Shepherdsville, Kentucky 40165.

6.3 Document Review

This FYR included a review of relevant site-related documents, including the ROD, remedial action reports and recent monitoring data. Appendix A provides a complete list of the documents reviewed.

ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. Applicable requirements are those cleanup standards, standards of control

and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are more stringent than federal requirements may be applicable or relevant and appropriate. To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical-specific ARARs include MCLs under the federal Safe Drinking Water Act and ambient water quality criteria enumerated under the federal Clean Water Act.

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity, such as discharge of contaminated ground water or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

Remedial actions are required to comply with the chemical-specific ARARs identified in the ROD. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed. The final remedy selected for the Site was designed to meet or exceed all chemical-specific ARARs and meet location- and action-specific ARARs, which were identified in the 1991 ROD. Restoration of the spring water should be achieved through treatment with carbon filters and natural air stripping. The NCP requires that state ARARs be met if they are more stringent than federal requirements. ARARs identified in the ROD for soil and ground water at the Site are considered for this FYR and listed in Tables 6 and 7 below.

Ground Water ARARs

Based on federal drinking water MCLs (40 CFR 141-143), the remedy selected in the 1991 ROD established chemical-specific ARARs for 11 ground water COCs. This review confirmed that two of the MCLs, for chloroform and bis-2-ethylhexyl phthalate, have changed since issuance of the 1991 ROD. In 1991, chloroform had an individual MCL of 100 micrograms per Liter (µg/L). Currently, chloroform is regulated as one of a group of contaminants known as trihalomethanes (THMs). This group includes chloroform,

bromodichloromethane, dibromochloromethane and bromoform. The MCL for total THMs is 80 µg/L; since chloroform is the only THM identified as a COC for the Site, the MCL for total THMs is presented as the MCL for chloroform. The 1991 ROD listed a value of 4 µg/L as the proposed MCL for bis-2-ethylhexyl phthalate. However, since 1991, the finalized MCL has been 6 µg/L, which is slightly higher than the proposed MCL. Table 6 below compares the MCLs established as ARARs for ground water in the 1991 ROD with current MCLs.

Table 6. Previous and Current Chemical-Specific ARARs for Ground Water (µg/L)

COC	MCLs in 1991 ROD[a]	MCLs as of 2012[b]	ARARs Change
Chloroform	100	80	More stringent
1,1-Dichloroethene	7	7	No
DCE	70	70	No
trans-DCE	100	100	No
PCE	5	5	No
Toluene	1,000	1,000	No
1,1,1-Trichloroethane	200	200	No
TCE	5	5	No
Vinyl chloride	2	2	No
Xylenes	10,000	10,000	No
bis-2-ethylhexylphthalate	4[c]	6	Less stringent

Notes

a. MCLs listed in Table 20 of the 1991 ROD.
b. Current federal Primary Drinking Water Standards available at: http://water.epa.gov/drink/contaminants/index.cfm (accessed 10/07/12).
c. Value listed in the 1991 ROD is a proposed MCL. However, the MCL for bis-2(ethylhexyl)phthalate is not final.

Surface Water Discharge ARARs

The remedy selected in the 1991 ROD required that effluent from the treatment systems meet National Pollution Discharge Elimination System (NPDES) standards regulated by the State of Kentucky. There have been no changes to the NPDES discharge requirements for the treated effluent between 1991 and 2012 (Table 7).

Table 7. Previous and Current Chemical-Specific ARARs for Surface Water (µg/L)

COC	NPDES – ARARs in 1991 ROD[a]	NPDES- ARARs in 2012[b]	ARARs Change
Chloroform	15.7	15.7	No
1,1-Dichloroethene	1.85	1.85	No
DCE	1.85	1.85	No
trans-DCE	1.85	1.85	No
PCE	8.85	8.85	No
Toluene	424,000	424,000	No
1,1,1-Trichloroethane	1,300,000	1,300,000	No
TCE	80.7	80.7	No
Vinyl chloride	525	525	No
Xylenes	no criteria	no criteria	No

Notes

a. Lower of the MCL or Kentucky Pollution Discharge Elimination System standard listed in Appendix A of the 1991 ROD.

b. Lower of the current MCL and Kentucky Water Quality Criteria for Protection of Human Health from the Consumption of Fish Tissue (http://lrc.ky.gov/kar/401/010/031.htm) (accessed 10/07/12).

Soil ARARs

No federal or state contaminant-specific ARARs are promulgated for soil cleanup levels. The 1991 and 1996 RODs did not specify ARARs for soil.

Institutional Control Review

Institutional controls are in place at the Site to prevent future ground water and spring water use. Institutional controls are also in place and appear effective for areas of the Site that do not achieve unlimited use/ unlimited exposure. However, soil and land use controls are not identified as part of the remedy in site decision documents, although they have been implemented by the PRPs. Specific areas of the Site are restricted from being used for residential purposes. Table 8 lists the institutional controls associated with areas of interest at the Site. Figure 3 illustrates the locations of the areas of interest at the Site. The technical assessment in Section 7 further discusses whether or not land use restrictions are needed.

Table 8. Institutional Control (IC) Summary Table

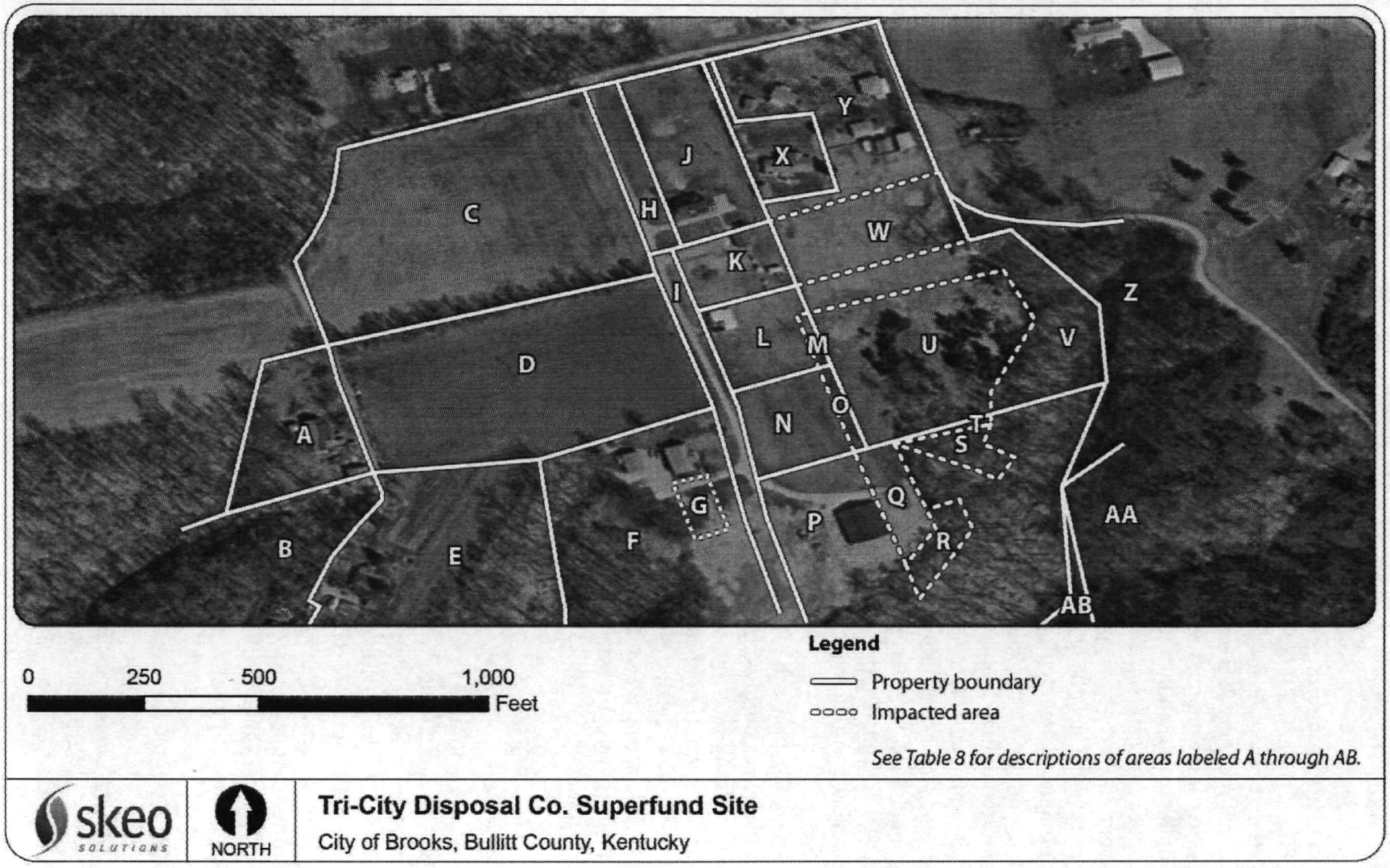
Map Identification	Owner	Bullitt County Book/Page Number for parcel identification	Bullitt County Book/Page Number for IC	Date Environmental Covenant Recorded with Bullitt County	Restrictions in place	Restrictions called for in decision documents
A	Larry Roger Klapper	DB 187, Page 419	DB 752, Page 536-549	1/20/2010	GW SW	GW SW
B	Roger Klapper	DB 736, Page 20	DB752, Page 522-535	1/20/2010	GW SW	GW SW
C	BDHM, INC.	DB 451, Page 418	NA	NA	None	None
D	Roger Klapper	DB 736, Page 20	DB752, Page 522-535	1/20/2010	GW SW	GW SW

Map Identification	Owner	Bullitt County Book/Page Number for parcel identification	Bullitt County Book/Page Number for IC	Date Environmental Covenant Recorded with Bullitt County	Restrictions in place	Restrictions called for in decision documents
E	Audrey Fox & Louis B. Fox	DB 736, Page 23	DB 752, Page 550-563	1/20/2010	GW SW	GW SW
F	Dennis R. Cox & Joi Cox	DB 719, Page 728	DB 756, Page 801-819	4/5/2010	GW SW SOIL CON	GW SW
G	Dennis R. Cox & Joi Cox	DB 719, Page 728	DB 756, Page 801-819	4/5/2010	GW SW RU AU CAP SOIL CON	GW SW
H	60 Foot Private Right of Way	DB 206, Page 92	NA	NA	None	None
I	40 Foot Private Right Of Way	NA	NA	NA	None	GW
J	Samantha Cox	BD 699, Page 631	NA	NA	None	None
K	William D.Cox, Jr.	DB 467, Page 280	DB 756, Page 837-853	4/5/2010	GW	GW
L	First Federal Savings Bank	DB 692, Page 57	DB 756, Page 820-836	4/5/2010	GW SW SOIL CON	GW SW
M	First Federal Savings Bank	DB 692, Page 57	DB 756, Page 820-836	4/5/2010	GW SW RU AU CAP SOIL CON	GW SW
N	Dennis R. Cox & Carol Cox	DB 525, Page 560	DB 756, Page 783-800	4/5/2010	GW SW SOIL CON	GW SW
O	Dennis R. Cox & Carol Cox	DB 525, Page 560	DB 756, Page 783-800	4/5/2010	GW SW RU AU CAP SOIL CON	GW SW
P	Dennis R. Cox	DB 711, Page 654	DB 752, Page 564-583	1/20/2010	GW SW SOIL CON	GW SW
Q	Dennis R. Cox	DB 711, Page 654	DB 752, Page 564-583	1/20/2010	GW SW RU AU CAP SOIL CON	GW SW
R	Dennis R. Cox	DB 711, Page 654	DB 752, Page 564-583	1/20/2010	GW SW	GW SW

Map Identification	Owner	Bullitt County Book/Page Number for parcel identification	Bullitt County Book/Page Number for IC	Date Environmental Covenant Recorded with Bullitt County	Restrictions in place	Restrictions called for in decision documents
					RU AU CAP SOIL CON	
S	Dennis R. Cox	DB 711, Page 654	DB 752, Page 564-583	1/20/2010	GW SW RU AU CAP SOIL CON	GW SW
T	Dennis R. Cox	DB 711, Page 654	DB 752, Page 564-583	1/20/2010	GW SW RU AU CAP SOIL CON	GW SW
U	Donna Stigler & Debbie Leedy	DB 604, Page 207	DB 796, Page 49-70	2/13/2012	GW SW RU AU CAP SOIL CON	GW SW
V	Donna Stigler & Debbie Leedy	DB 604, Page 207	DB 796, Page 49-70	2/13/2012	GW SW SOIL CON	GW SW
W	Donna Stigler & Debbie Leedy	DB 604, Page 207	DB 796, Page 49-70	2/13/2012	GW	GW
X	Rodney F. Leedy & Deborah G. Leedy	DB 411, Page 77	NA	NA	None	None
Y	Donna Stigler & Debbie Leedy	DB 604, Page 207	NA	NA	None	None
Z	Lois A. Pierce	DB 675, Page 312	NA	NA	None	None
AA	Joseph A. Givens	DB 407, Page 515	NA	NA	None	None
AB	Dennis R. Cox & Joi Cox	DB 719, Page 728	NA	NA	None	None

Notes: GW = Ground water; SW = Surface water; RU = No residential use; AU = No agricultural use; AU2 = No agricultural use including crops (except animal grazing is permitted); CAP = No disturbance of cap; SOIL = No soil disturbance; CON = No construction.

Figure 3: Institutional Control Base Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site. This map was created using maps from L.S. Sims & Associates Annual Report.

6.4 Data Review

Quarterly monitoring reports for quarter 3 and quarter 4 of 2007 and 2008; all quarters of 2009, 2010 and 2011; and quarters 1 through 3 of 2012 were reviewed for treatment system effluent or surface water discharge results. Fourth quarter reports also provided annual ground water monitoring and treatment system influent results. The use of Cox Spring and Unnamed Spring #1 treatment systems was discontinued while the PRPs conducted a demonstration project to determine the disposition of VOC in the streams of Cox Spring and Unnamed Spring #1. The study concluded that VOCs dissipated within about 300 feet of the spring sources and therefore, carbon treatment was no longer necessary. Thus, the last monitoring sample taken of treatment system influent at Cox Spring and Unnamed Spring #1 occurred in quarter 4 of 2010. The 2012 ESD officially discontinued spring water treatment at the Site and scaled back the requirements for long-term monitoring. Sampling of surface water discharge from Klapper Spring, Cox Spring and Unnamed Spring #1 currently takes place on a semi-annual basis while annual ground water monitoring continues at MW-02 and MW-04. The surface water and ground water monitoring require the analysis of the following 10 parameters: chloroform, cis-DCE, trans-DCE, 1,1-dichloroethene, PCE, toluene, 1,1,1-trichloroethane, TCE, vinyl chloride and total xylenes.

During the current FYR period, each of the springs and monitoring wells had exceedances during the annual influent and ground water monitoring events. Monitoring results from the treatment systems' effluent, sampled until 2011, and from the semi-annual monitoring of surface water discharge from the three springs, which began in 2012, have exceeded NPDES requirements. However, the 2012 ESD states that because VOCs in spring water dissipate within 300 feet of the spring and there is no potable use of spring water or ground water, the remedy remains protective of human health and the environment.

Ground Water

According to the 1991 ROD, the long-term ground water monitoring program includes sampling of ground water and influent at the Cox Spring and Unnamed Spring #1 treatment systems. The 1991 OU1 ROD requires the influent to the Cox Spring and Unnamed Spring #1 treatment systems to achieve ground water MCLs. As required by the 1991 ROD, the PRP contractors collected samples of ground water and treatment system influent on an annual basis until 2010. In 2011, the PRPs conducted a demonstration project and the EPA approved the PRPs to discontinue use of the Cox Spring and Unnamed Spring #1 treatment systems. The data from the ongoing annual ground water monitoring events conducted at MW-02 and MW-04 as well as the influent sampling data from the 2007 monitoring event until the 2010 monitoring event are discussed below.

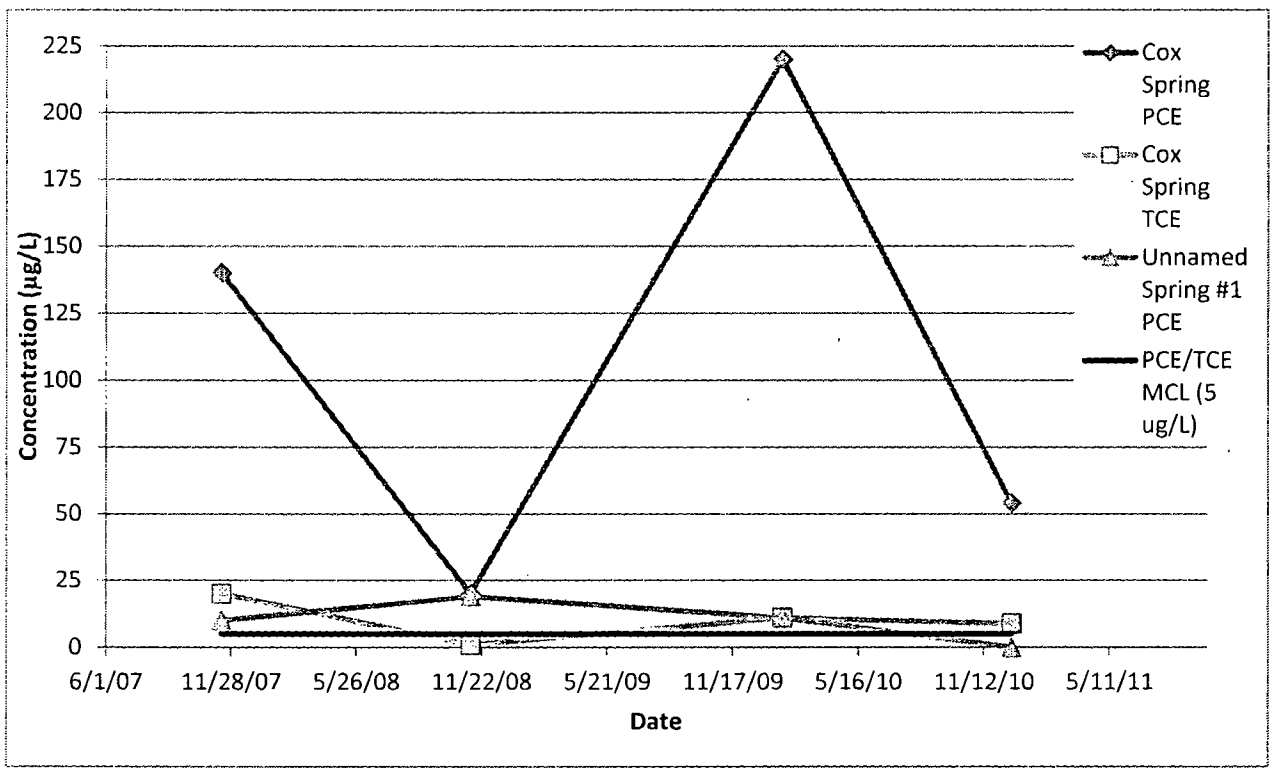
Influent Sampling Summary for Cox Spring and Unnamed Spring #1
The Site's PRPs conducted annual sampling of treatment system influent from 2007 until 2010. From 2007 to 2010, Cox Spring influent sampling detected chloroform, cis-DCE

and 1,1,1-trichloroethane but these concentrations stayed well below and did not exceed MCLs of 70 µg/L, 70 µg/L and 200 µg/L, respectively. Sampling detected exceedances of PCE and TCE MCLs of 5 µg/L in Cox Spring influent. The highest concentration of PCE recorded over the FYR period, 220 µg/L, was detected in January 2010 as part of the 2009 annual long-term monitoring sampling event.

The Unnamed Spring #1 influent sampling detected cis-DCE, 1,1,1-trichloroethane, TCE and PCE. Concentrations of cis-DCE, 1,1,1-trichloroethane and TCE were well below their MCLs. PCE was the only contaminant to exceed the MCL. During the 2008 annual long-term monitoring sampling event, sampling detected a PCE concentration of 19 µg/L. However, the following year, the PCE concentration had declined to 11 µg/L. Although concentrations of PCE exceeded the MCL, the 2012 ESD states that because VOCs in spring water dissipate within 300 feet of the spring and there is no potable use of spring water or ground water, the remedy remains protective of human health and the environment.

During the FYR period, sampling detected exceedances of MCLs for PCE and TCE in ground water. Figure 4 displays PCE and TCE concentrations in Cox Spring and Unnamed Spring #1 influent (ground water) from 2007 until 2010. The PRPs did not collect a sample from Unnamed Spring #1 during the 2010 influent sampling event due to frozen conditions at the spring.

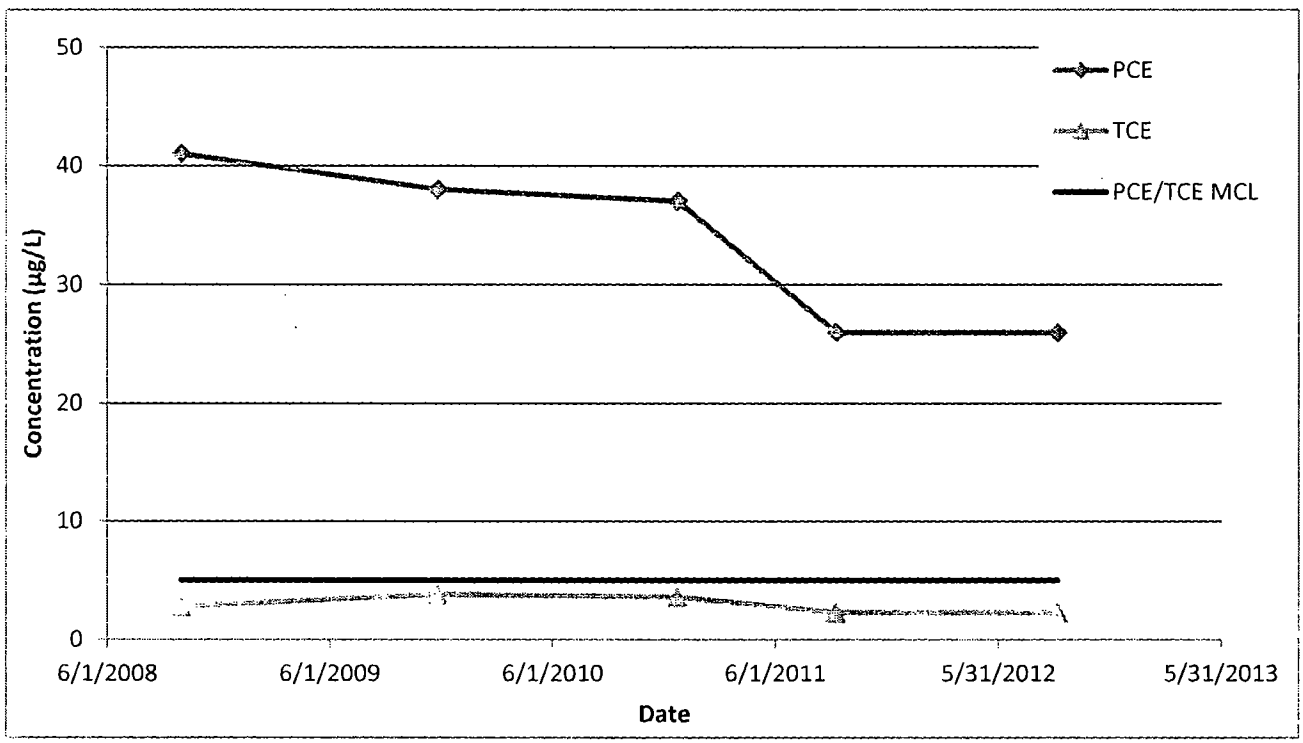
Figure 4. PCE and TCE Concentrations in Spring Water (2007-2010)



Annual Monitoring of MW-02 and MW-04

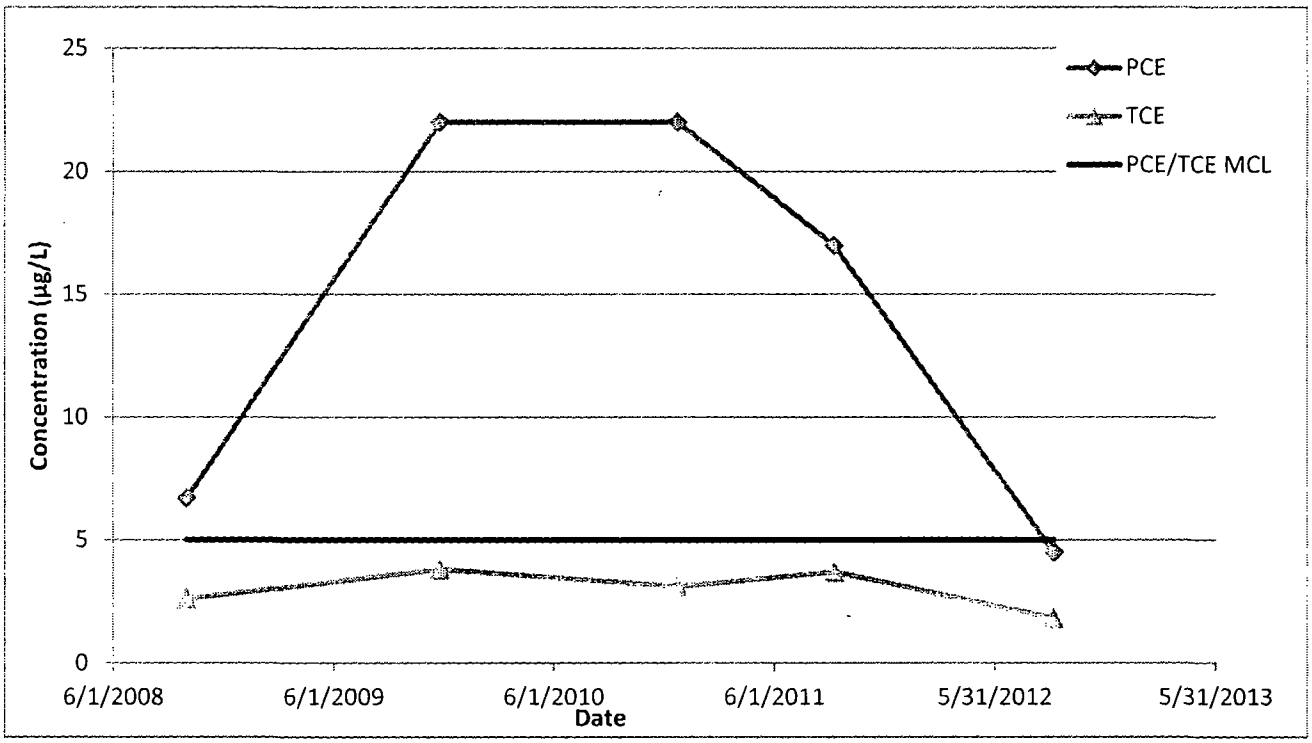
During the current FYR period, sampling detected cis-DCE, trans-DCE, 1,1,1-trichloroethane, TCE and PCE in MW-02. Cis-DCE, trans-DCE, 1,1,1-trichloroethane and TCE concentrations did not exceed the MCL ground water cleanup goals. Sampling results from MW-02 over the current FYR period identify PCE as the only COC that exceeded its cleanup goal of 5 µg/L. Although concentrations of PCE over the FYR period have declined from 41 µg/L in 2008 to 26 µg/L in 2012, concentrations have fluctuated and remain above PCE ground water cleanup goals. Figure 5 below shows PCE and TCE concentrations from 2008 until 2012 in MW-02.

Figure 5. PCE and TCE Concentrations in MW-02 (2008-2012)



At MW-04 during the current FYR period, sampling detected cis-DCE, 1,1,1-trichloroethane, 1,1-dichloroethene, TCE and PCE. Cis-DCE, 1,1,1-trichloroethane, 1,1-dichloroethene and TCE concentrations did not exceeded the MCL ground water cleanup goals. Sampling results from MW-04 over the current FYR period identify PCE as the only COC that exceeded its cleanup goal of 5 µg/L. Since 2009, PCE concentrations in MW-04 have decreased. Sampling in 2012 showed a PCE concentration of 4.5 µg/L, which is just below the MCL cleanup goal. However, due to the fluctuations of PCE detected in MW-04 prior to 2008, additional sampling results over the coming years will be needed to verify a downward trend. Figure 6 below shows PCE and TCE concentrations from 2008 until 2012 in MW-04.

Figure 6. PCE and TCE Concentrations in MW-04 (2008-2012)



Surface Water

The 1991 OU1 ROD requires Klapper Spring discharge and effluent from the Cox Spring and Unnamed Spring #1 treatment systems to meet NPDES performance standards. Use of the treatment systems at Cox Spring and Unnamed Spring #1 took place through the end of 2010. Although treatment ended, the 2012 ESD requires continued monitoring of spring water discharge from Cox Spring, Unnamed Spring #1 and Klapper Spring on a semi-annual basis. Therefore, this FYR reviews the results of both the treatment system effluent monitoring and the monitoring of the surface water discharge from the springs.

Klapper Spring Monitoring

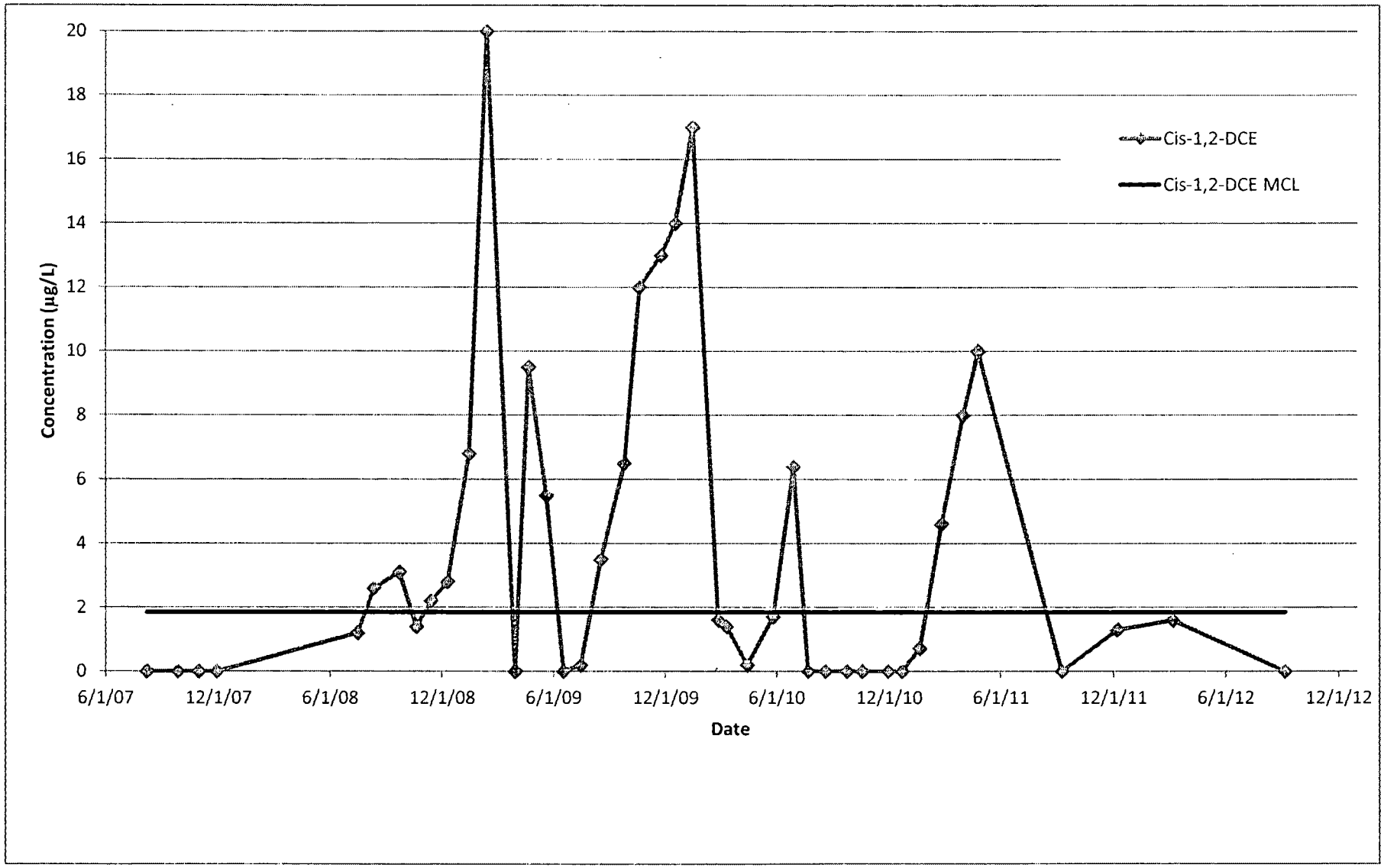
Sampling of Klapper Spring discharge during the FYR period detected concentrations of cis-DCE, toluene, 1,1,1-trichloroethane,TCE and PCE. Cis-DCE, toluene, 1,1,1-trichloroethane and TCE concentrations were below the NPDES surface water discharge requirements. Discharge from Klapper Spring exceeded the NPDES requirements for PCE once during the FYR period. This occurred in April 2011 when sampling detected a PCE concentration of 12 µg/L, which exceeds the NPDES requirement of 8.85 µg/L. However, since this time, PCE concentrations have not exceeded the NPDES requirements.

Cox Spring Monitoring

Sampling of effluent from Cox Spring's treatment system over the FYR period detected concentrations of chloroform, 1,1,1-trichloroethane and TCE that were below the NPDES

surface water discharge requirements. Cis-DCE, trans-1,1-dichloroethene and PCE were detected above the NPDES requirements over the FYR period. Sampling detected the most frequent exceedances for cis-DCE. During the review period, about half of detected concentrations of cis-DCE exceeded NPDES requirements (Figure 7). The highest concentrations of cis-DCE, 20 µg/L and 17 µg/L, were observed in February 2009 and January 2010, respectively. The frequency of these exceedances demonstrates that Cox Spring's treatment system was not effectively treating ground water before its discharge to the surface. Sampling also detected frequent exceedances of NPDES requirements for PCE. Over the review period, seven exceedances were observed. The highest concentration detected was 44 µg/L in April 2009. Sampling detected a concentration of 11 µg/L of trans-1,1-dichloroethene on one occasion during the FYR period. During all other sampling events, trans-1,1-dichloroethene was not detected.

Figure 7. Cis-DCE Concentrations in Cox Spring Effluent and Surface Water Discharge (2007-2012)



Unnamed Spring #1 Monitoring

Sampling of effluent from Unnamed Spring #1's treatment system as well as Unnamed Spring #1's surface water discharge detected chloroform, 1,1,1-trichloroethane, TCE, cis-DCE and PCE. Chloroform, 1,1,1-trichloroethane and TCE concentrations were well below NPDES requirements. Only three exceedances of NPDES requirements were observed for cis-DCE over the FYR period. These exceedances occurred in March, April and May 2009, when cis-DCE concentrations were 13 µg/L, 12 µg/L and 12 µg/L, respectively. All other samples taken during the FYR period did not detect cis-DCE. There were also three exceedances of NPDES requirements for PCE in Unnamed Spring #1 effluent during the FYR period. These exceedances also occurred in March, April and May 2009, when PCE concentrations were 13 µg/L, 17 µg/L and 17 µg/L, respectively. Since 2009, sampling has continued to detect PCE frequently. Concentrations of PCE have remained below NPDES requirements.

Soil

The OU1 confirmatory samples were collected in 1992 and were evaluated by the EPA to determine if there was a need for any actions under OU2. The confirmatory sampling included surface soil, subsurface soil, surface water and sediment samples. During the confirmatory sampling, six of the 21 subsurface soil samples collected from the removal area near the Cox, Sr. residence contained cis-DCE concentrations ranging from 64 µg/kg to 1,300 µg/kg; the average cis-DCE concentration for these six samples was 537 µg/kg. In addition, one subsurface soil sample collected from the removal area contained a TCE concentration of 740 µg/kg. None of the 21 subsurface soil samples collected from the removal area contained PCE concentrations greater than the quantitation limit. Of 11 subsurface soil samples collected from a disturbed area in the northern portion of the Site, cis-DCE and TCE were not detected at concentrations above quantitation limits, and two samples contained PCE at concentrations of 35 µg/kg and 86 µg/kg, with an average concentration of 60 µg/kg. All of these concentrations exceed current EPA Regional Screening Levels (RSLs)[1] for the protection of ground water at a DAF1 (Dilution Attenuation Factor of One) Soil Screening Level (SSLs).

Based on the results of the confirmatory sampling, the EPA concluded that the VOCs in subsurface soil did not constitute a significant concern at the time of the 1996 ROD and that there was no unacceptable risk to human health or the environment from these media and determined that there was no need to initiate an OU2 response. Therefore, the EPA issued a No Action ROD for OU2 in March 1996.

KDEP conducted additional soil sampling at the site in December 2001 and March 2002. KDEP collected surface soil samples in December 2001 and analyzed for dioxins and furans. KDEP also collected surface and subsurface soil samples at five locations associated with the former landfill area in March 2002 and analyzed for dioxins, furans, PCBs and metals. Although KDEP did not prepare a final report of the soil investigation, a February 11, 2008 technical memorandum from contractor Earth Tech to PRP Waste

[1] EPA's Regional Screening Levels (RSLs) revised November 2012 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm.

Management indicated that KDEP informed the PRPs that the dioxin/furan results from the surface soil did not represent a risk to area residents. In addition, KDEP indicated to the PRPs that there is contamination in the subsurface soil in the area of the former landfill that could result in risk to area residents if the overlying, clean soil is disturbed.

6.5 Site Inspection

On September 19, 2012, Bill Joyner (EPA), Jim Forney (Waste Management of Kentucky, Inc.), Scott Johnson (Conliffe, Sandmann & Sullivan), Bob Jameson (American Environmental Group Ltd.) and Treat Suomi and Lynette Wysocki (Skeo Solutions) met at the Site to participate in the site inspection. The site inspection participants discussed the implementation of institutional controls on the site properties and other issues from the previous FYR before taking a tour of the Site. The site inspection checklist and photos taken during the site inspection are provided in Appendices D and E, respectively. The group toured the Site to observe the current conditions and remedial components, including:

- Inactive ground water treatment system.
- New construction of a barn and water line/pump.
- Vegetative cover.
- Monitoring wells.
- Unnamed #1, Cox and Klapper Springs.
- Residences.
- Gravel and paved roads.

Site inspection participants found both MW-02 and MW-04 secured and in good condition. The group also inspected the inactive ground water treatment building, which was locked and in good condition. The group discussed the new construction of a water line extension with hand pump from the Dennis Cox residence under the gravel road to the field across from the residence. Scott Johnson stated that he was not notified about the construction and did not think that the EPA or the state was notified either. Bob Jameson stated that the construction was likely conducted just prior to the site inspection because it was not present on site during the September 1, 2012 monitoring event. Site inspection participants toured the impacted pasture area used by goats and horses for grazing. The steep ravine south of the area prohibited participants from inspecting Unnamed Spring #1. In 2012, work was completed to install erosion control materials, fencing and vegetation that stabilized the sloped area leading down to the ravine and Unnamed Spring #1. Site inspection participants inspected Cox Spring and found it to be in good condition. The group toured Klapper Road but was unable to inspect Klapper Spring due to dense vegetation between the road and the spring.

Also on September 19, 2012, Skeo Solutions staff visited the Site's information repository, Ridgway Memorial Library, located at 127 Walnut Street, Shepherdsville, Kentucky 40165. The information at the library included the Administrative Record index as of 1996, an index of the Removal Site Administrative Record as of 1994, the 1991 OU1 ROD, the 1996 OU2 ROD, the 2003 FYR and the 2012 ESD. The library was

missing a copy of the 2008 FYR. Skeo Solutions staff also visited the Bullitt County Clerk Office to verify filing of the environmental covenant in place as part of the Site's institutional controls.

6.6 Interviews

The FYR process included interviews with parties affected by the Site, including the current landowners and regulatory agencies involved in Site activities or aware of the Site. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. Interviews were requested with the PRPs and O&M contractor, but have not yet occurred. The interviews are summarized below. Appendix C provides the complete interviews.

Wesley Turner: Mr. Turner is KDEP's site representative. Mr. Turner believes that all activities at the Site are going as planned. He stated that the remediation system and conditions are appropriate and that the remedy is performing well. Mr. Turner is not aware of any changes to state laws or land uses that would affect the protectiveness of the Site. He explained that there were some concerns from residents at the Site regarding the placement of environmental covenants on their properties but additional data determined that restrictions were not needed for these properties. Mr. Turner stated that all institutional controls are in place and protective of human health and the environment based on all data submitted to date. KDEP staff has conducted site visits to inspect the cap and surrounding area; no actions have been needed. Mr. Turner stated that the PRPs have been cooperative and responsive to KDEP's requests.

Jim Forney: Mr. Forney is the Waste Management representative for the Site. Mr. Forney feels that the remedial activities are going well as demonstrated by the ESD, the reduction in monitoring and the ability to end treatment at the Site. He feels that the remedy is performing very well. Mr. Forney is not aware of any complaints or inquiries regarding the Site and feels that at this stage, the Site has limited effect on the surrounding community. He feels that the EPA has kept him well-informed about the Site. He hopes that the EPA will move the Site towards delisting in the future.

Residents: Several area residents were interviewed and expressed comments and concerns including that they felt the Site was not cleaned up properly or that it had been cleaned up "better". In addition, residents expressed the opinion that they should have been bought out by the PRPs. It was indicated that because sampling wells are not flush mounted, it is difficult to work around them and that the Site is a "complete eye sore". One resident stated that he was very aware of the Site, as well as the cleanup, but really does not think about it anymore and said the neighbors do not discuss it anymore.

Local Officials: Interviews were conducted with City officials in Shepherdsville, KY. They stated that they have not received any calls, complaints or concerns about the Site.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

The review of decision documents and ARARs and the results of the site inspection indicate that the remedy is functioning as intended by site decision documents. Residents are connected to the public water supply and no one is currently using any ground or spring water at the Site. In addition, institutional controls are in place to prevent future ground water and spring water use.

The EPA signed the OU2 ROD on March 29, 1996. The 1996 ROD indicated that previous response actions at the Site, including emergency removal and treatment of contaminated ground water, appear to have eliminated the need for additional remedial action for soil at the Site. The decision for no further action for OU2 was not expected to result in hazardous substance remaining on-site above health-based levels. However, KDEP took additional surface and subsurface soil samples in 2001 and 2002 that indicated there was subsurface soil contamination remaining at the Site that could present a risk to area residents if the surface soil is disturbed. The 2012 ESD called for, and the PRPs implemented, additional soil cover in the area of the old landfill area. In addition, the PRPs implemented soil and land use institutional controls for areas of the Site with possible remaining subsurface soil contamination. The EPA OU2 ROD and OU1 ESD did not indicate soil and land use controls were required as part of the remedy. The EPA reviewed the data and concurred with the findings of Earth Tech and KDEP that restrictive covenants and institutional controls for land use should remain in place.

In 2012, new construction of a water line extension with a hand pump (using public water supplies) occurred at the Site in a restricted-use area without notification of the PRPs or the EPA. The PRPs should ensure that residents are informed regarding the land use restrictions in place on site and how to obtain approval for projects.

PCE concentrations at MW-02 remain above MCLs but have declined since 2006. However, monitoring is continuing and there are no completed exposure pathways. Concentrations at this well will continue to be monitored and should be evaluated during the next FYR to ensure they will meet cleanup goals. In addition, although MW-04 had increases in PCE concentrations over the review period, the concentrations were below MCLs in 2012. Continued monitoring will assist in determining whether concentrations in this well are consistently meeting the cleanup goals. During review of the revised O&M Plan, monitoring of additional parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Since the EPA signed the Site's 1991 ROD, the ground water cleanup goal for THM, including chloroform, changed from 100 µg/L to 80 µg/L. However, the lower goal does not affect the protectiveness of the selected remedy for ground water or spring water

because the monitoring data collected between 2007 and 2011 indicate that chloroform is below detection or well below the MCL. However, the EPA may want to consider changing the cleanup goal in a site decision document.

There have been changes to the exposure assumptions since the time of remedy selection; however, these changes do not currently affect protectiveness at the Site. The exposure assumptions associated with exposure to ground water used in the original risk assessment assumed the use of spring water for potable purposes. Subsequently, a 2008 focused risk assessment, included in the March 2012 ESD, reevaluated non-potable uses of the springs because potable uses are currently not occurring and are being controlled through institutional controls. The results of the focused risk assessment support the finding that that the remedy remains protective.

Since the 1991 ROD, new risk assessment guidance has become available that allows for the evaluation of indirect exposures to VOCs in the subsurface via the vapor intrusion exposure pathway. Since this exposure pathway had not been quantified in the 2008 risk assessment, a vapor intrusion risk assessment was performed in 2009 based on soil vapor samples modeled to indoor air, which demonstrated that the resultant risks and non-cancer hazards were within acceptable limits, supporting the finding that that the remedy remained protective.

Since 2009, the EPA has issued additional guidance recommending the use of multiple lines of evidence to evaluate the vapor intrusion pathway because this pathway is influenced by many variables, including the geology and hydrogeology of a site, building characteristics and seasonal changes. Although a second round of soil vapor was not collected for direct comparisons to the previous vapor intrusion study in 2009, this FYR evaluated other lines of evidence to determine if the vapor intrusion exposure pathway remains of no concern to include:

- Using the EPA's vapor intrusion screening level (VISL) calculator for evaluating current overburden ground water contaminant concentrations near the residence.
- Evaluating VOC concentrations in ground water in 2009 near the Cox Sr. residence with current ground water data.
- Evaluating historical removal and remediation activities conducted at the Site.

Based on the 2009 vapor intrusion risk evaluation, the additional lines of evidence support that the remedy remains protective as follows:

- Evaluation of current ground water concentrations in the VISL calculator using ground water data from overburden wells screened across the water table indicate that screening-level risks are within the EPA's risk management range.
- Since the primary source of contaminants has been removed, PCE and TCE in ground water continue to decline in concentration.

Appendix F presents additional detail on the multiple lines of evidence for this evaluation.

Toxicity factors for some of the contaminants of potential concern have changed since the publication of the risk assessments, most notably for dioxin, PCE, TCE and chromium. Although the 1991 ROD did not identify dioxin as a site COC, KDEP conducted dioxin sampling near residences in December 2001 and in the pasture in March 2002; evaluation of those results in 2003 by the PRPs at the request of the EPA compared the results to the EPA Region 3 Risk-Based Concentrations (RBCs). This analysis indicated that PCBs and lead exceeded the RBCs in one sample location, TC5-D, and the PRPs concluded that there was no threat for direct contact with surface soil since TC5-D was collected in the subsurface from 3.5 to 4 feet. Although KDEP did not prepare a final report of the soil investigation, a February 11, 2008 technical memorandum from Earth Tech to Waste Management indicated that KDEP informed the PRPs that the dioxin/furan results from the surface soil did not present a risk to area residents. In addition, KDEP indicated to the PRPs that there is contamination in the subsurface soil in the area of the former landfill that could result in risk to area residents if the overlying, clean soil is disturbed. The 2008 FYR also evaluated the KDEP data using the EPA's 2004 Region 9 preliminary remediation goals (PRGs), which were more current than the RBCs used previously. The 2008 FYR identified PCBs and lead exceeding residential PRGs at multiple subsurface locations. The report concluded that there was no evidence of surface soil contamination. However, some subsurface samples contain lead and PCB concentrations that exceed PRGs, raising concerns that the subsurface soil contamination may require institutional controls to prohibit excavation and construction on affected areas of the Site.

Toxicity equivalency factors (TEFs) changed in 2006, resulting in a decrease of the total dioxin equivalent concentration (TEQ) estimated by KDEP in 2002. Although the current TEFs were available in 2008, contractor Earth Tech conservatively used the outdated TEFs for evaluating the dioxin data. In addition, on February 17, 2012 the EPA released a new non-cancer reference dose (RfD) toxicity value for dioxin which results in a residential RSL of 50 ppt based on a non-cancer hazard index of 1.0. Using the new TEFs and RfD values, the historical data were reevaluated for protectiveness (Appendix F). The new RfD increases the overall hazard index value for each receptor. However, these changes do not affect the overall risk conclusions of the 2008 FYR because the pasture soil cover implemented as selected in the 2012 ESD and institutional controls restricting disturbance of the capped area ensure that there is not a completed exposure pathway. As discussed in Section 7.1, the EPA reviewed the data and concurred with the findings of Earth Tech and KDEP that restrictive covenants and institutional controls for land use should remain in place. In addition, the EPA may want to consider adoption of a site cleanup standard for dioxin due to the changes in toxicity values for this contaminant. The detailed evaluation that supports this conclusion is presented in Appendix F.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There is no additional information that calls into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

The review of decision documents and ARARs and the results of the site inspection indicate that the Site's remedy is functioning as intended by site decision documents. Residents are connected to the public water supply and no one is currently using any ground or spring water at the Site. In addition, institutional controls are in place to prevent future ground water and spring water use.

There have been fluctuations and exceedances of MCLs in concentrations of PCE and TCE at the Site during the previous five years. During review of the Site's revised O&M Plan, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.

The EPA decision for no further action for OU2 was not expected to result in hazardous substance remaining on site above health-based levels. However, additional surface and subsurface soil samples in 2001 and 2002 indicated subsurface soil remained at the Site that could present a risk to area residents if the surface soil is disturbed. However, soil cover and institutional controls ensure that there are no current completed exposure pathways.

There have been no significant changes to the exposure assumptions since the time of remedy selection that affect protectiveness at the Site. The results of the Site's 2008 focused risk assessment support the conclusion that the Site's remedy remains protective of human health and the environment, as does the 2009 vapor intrusion risk evaluation, and the additional multiple lines of evidence vapor intrusion evaluation conducted as part of this FYR. However, due to significant changes in toxicity values for dioxin, the EPA may want to consider adoption of a site cleanup standard for dioxin.

8.0 Issues

Table 9 summarizes the current site issue.

Table 9: Current Site Issues

Issue	Affects Current Protectiveness?	Affects Future Protectiveness?
There have been fluctuations and exceedances of MCLs in concentrations of PCE and TCE at the Site during the previous five years.	No	Yes

9.0 Recommendations and Follow-up Actions

Table 10 provides recommendations to address the current site issue.

Table 10: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
There have been fluctuations and exceedances of MCLs in concentrations of PCE and TCE at the Site during the past five years.	During review of the revised O&M Plan, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.	EPA	EPA	4/30/2014	No	Yes

10.0 Protectiveness Statements

The remedy at OU1 is protective of human health and the environment. Affected residents remain connected to the public water supply, the use of spring water and ground water at the Site remains restricted by institutional controls, and long-term monitoring is ongoing. However, to ensure long-term protectiveness, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.

The remedy at OU2 is protective of human health and the environment. Additional soil cover has been added to the impacted soil area to add a greater physical separation between residual soil contaminants. Ground surface and institutional controls have been implemented to restrict land uses to appropriate uses.

The remedy at the Site is currently protective of human health and the environment in the short term. Exposure pathways that could result in unacceptable risks are being controlled. However, to ensure protectiveness in the long term, additional monitoring parameters should be considered to evaluate attenuation at the Site and determine the timeframe for achieving cleanup goals.

11.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

2008 Tri-City Five Year Review #3 Report Briefing. Prepared by EPA.

Action Memorandum for Removal Action at the Tri-City Industrial Disposal Site. Brooks, Kentucky. May 24, 1988.

Construction Documentation Report: Tri-City Industrial Disposal Site. July 2012. Prepared for: Waste Management Kentucky, Inc. Prepared by AECOM.

Explanation of Significant Differences: Tri City Industrial Disposal Site, Operable Unit 1, Brooks, Bullitt County, Kentucky. March 2012. Prepared by EPA.

Final Operation and Maintenance Manual. Tri-City Industrial Disposal Site. Operable Unit #1. Brooks, Bullitt County, Kentucky. November 1994. Prepared by Rust Environment & Infrastructure. Prepared for EPA.

Final Remedial Investigation Report. August 1990. Prepared by Ebasco Services Incorporated. Prepared for EPA.

Final Remedial Investigation Report (Volume V). APPENDIX A: Data Summary Table and CLP Data Sheets. August 1990. Prepared by Ebasco Services Incorporated. Prepared for EPA.

Final Remedial Investigation Report (Volume II). APPENDIX F: Risk Assessment. August 1990. Prepared by Ebasco Services Incorporated. Prepared for EPA.

Five-Year Review Fact Sheet. Tri-City Disposal Site. Brooks, Kentucky. September 2003. Prepared by EPA.

Five-Year Review Report. Tri-City Disposal Co., Brooks, Bullitt County, Kentucky. April 2003. Prepared by EPA Region 4 and Earth Tech, Inc.

Five-Year Review Report. Tri-City Disposal Co., Brooks, Bullitt County, Kentucky. April 2008. Prepared by E2 Inc. Prepared for EPA Region 4.

Focused Risk Assessment of Potential Exposures to Volatile Organic Compounds Detected in Spring Water (Included in ESD 2012). January 2008. Prepared for Tri-City Disposal. Prepared by Earth Tech, Inc.

Interim OSC Report on the Tri-City Industrial Dump Sampling and Removal Status. August 22, 1988.

Quarterly Progress Report No. 107, Third Quarter, 2007: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. January 29, 2008. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 108, Fourth Quarter, 2007: Tri-City Industrial Disposal Site

Brooks, Bullitt County, Kentucky. February 19, 2008. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 111, Third Quarter, 2008: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. October 27, 2008. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 112, Fourth Quarter, 2008: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. February 23, 2009. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 113, First Quarter, 2009: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. June 10, 2009. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 114, Second Quarter, 2009: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. July 15, 2009. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 115, Third Quarter, 2009: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. October 21, 2009. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 116, Fourth Quarter, 2009: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. March 3, 2010. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 117, First Quarter, 2010: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. April 19, 2010. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 118, Second Quarter, 2010: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. August 2, 2010. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 119, Third Quarter, 2010: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. October 12, 2010. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 120, Fourth Quarter, 2010: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. January 18, 2011. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 121, First Quarter, 2011: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. April 19, 2011. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 122, Second Quarter, 2011: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. August 1, 2011. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 123, Third Quarter, 2011: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. October 10, 2011. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 124, Fourth Quarter, 2011: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. January 23, 2012. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 125, First Quarter, 2012: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. April 10, 2012. Prepared by AECOM. Prepared for EPA.

Quarterly Progress Report No. 126, Second Quarter, 2012: Tri-City Industrial Disposal Site Brooks, Bullitt County, Kentucky. July 11, 2012. Prepared by AECOM. Prepared for EPA.

Record of Decision. Remedial Alternative Selection. Tri-City Industrial Disposal Site, Operable Unit #1. Brooks, Bullitt County, Kentucky. August 28, 1991. Prepared by EPA.

Record of Decision. Tri-City Industrial Disposal Site, Operable Unit #2. Brooks, Bullitt County, Kentucky. March 29, 1996. Prepared by EPA.

Request to Remove Requirement for Groundwater Restrictions and Institutional Controls on certain properties. Tri-City Industrial Disposal Site, Brooks, Bullitt County, Kentucky. July 14. 2010. Prepared by AECOM. Prepared for EPA.

Review of Soil Vapor Sampling Summary Report. Tri-City Industrial Disposal Site. Brooks, Bullitt County, Kentucky. August 17, 2009. Reviewed by Ofia Hodoh, Technical Services Section, Superfund Support Branch. Reviewed for Femi Akindele, RPM, Superfund Remedial & Site Evaluation Branch.

Site Vicinity Map and Site Map for Tri City Industrial Disposal. 2010. Prepared by AECOM.

Soil Vapor Sampling Work Plan. Tri-City Industrial Disposal Site. Brooks, Bullitt County, Kentucky. April 29, 2009. Prepared by AECOM. Prepared for EPA.

Tri-City Industrial Disposal NPL Site. 10/19/95 Dioxin Sampling Analytical Report. December 13, 1995. Submitted by Kentucky Department for Environmental Protection, Natural Resources and Environmental Protection Cabinet. Submitted to EPA.

Appendix B: Press Notice

The U.S. Environmental Protection Agency, Region 4
Announces a Five-Year Review for
the Tri-City Disposal Company Site,
Shepherdsville, Bullitt County, Kentucky

Purpose/Objective: The U.S. Environmental Protection Agency (EPA) is conducting a Five-Year Review of the remedy for the Tri-City Disposal Company Superfund site (the Site) in Shepherdsville, Kentucky. The purpose of the Five-Year Review is to ensure that the selected cleanup actions effectively protect human health and the environment.

Site Background: The 349-acre Tri-City Disposal Company site (the Site) is located south of Hwy 1526, approximately 4 miles west of U.S. Interstate 65 in Shepherdsville, Bullitt County, Kentucky. Between 1964 and 1967, 57 acres of the Site operated as a landfill for scrap lumber, fiberglass insulation and other wastes. Additionally, site operations disposed of drummed liquid waste directly on to the ground at the Site. Waste disposal operations resulted in contamination of ground water and soil at the Site. In 1988, EPA performed an Emergency Removal Action in response to "black ooze" found in a side yard of an on-site residence. EPA dug up approximately 165 drums and removed 400 gallons of free liquid as well as 800 cubic yards of suspected contaminated soil. EPA proposed the Site for listing on the National Priorities List (NPL) in 1988 and finalized the Site on the NPL in 1989. Major contaminants at the Site included volatile organic compounds (VOCs) and vinyl chloride.

Cleanup Actions: EPA designated two operable units (OUs) to address the Site's soil, ground water, sediment, ambient air and surface water contamination. EPA signed the Site's OU1 Record of Decision in August 1991, selecting a remedy to address sitewide contamination. The major components of the OU1 remedy included treatment of surface water springs; confirmatory soil and air sampling; monitoring of surface water, sediment and ground water; provision of potable water to impacted residents; and implementation of institutional controls at the Site to restrict ground water use. EPA signed the Site's OU2 ROD in March 1996, selecting the final remedy for ground water and soil contamination at the Site. The remedy selected for OU2 included a decision of No Further Action. EPA determined that emergency removal actions and ground water treatment had eliminated the need for additional action at the Site.

Five-Year Review Schedule: The National Contingency Plan requires that remedial actions that result in any hazardous substances, pollutants or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years to ensure the

protection of human health and the environment. The fourth of the Five-Year Reviews for the Site will be completed by April 2013 and a copy of the final report will be placed in the information repository located at the Ridgeway Memorial Library, 127 Walnut Street in Shepherdsville.

EPA Invites Community Participation in the Five-Year Review Process: EPA is conducting this Five-Year Review to evaluate the effectiveness of the Site's remedy and to ensure that the remedy remains protective of human health and the environment. As part of the Five-Year Review process, EPA staff are available to answer any questions about the Site. Community members who have questions about the Site or the Five-Year Review process, or who would like to participate in a community interview, are asked to contact:

William Joyner, EPA
Remedial Project Manager
Phone: (404) 562-8795
E-mail: Joyner.William@epa.gov

Angela Miller, EPA
Community Involvement Coordinator
Phone: (404) 562-8561 | (877) 718-3752
E-mail: Miller.Angela@epa.gov

Mailing Address: U.S. EPA Region 4, 61 Forsyth Street, S.W., 11th Floor, Atlanta, GA 30303-8960

Additional site information is available at the Site's local document repository, located at Ridgeway Memorial Library, 127 Walnut Street, Shepherdsville, KY 40165 and online at: http://www.epa.gov/region4/superfund/sites/npl/kentucky/trictky.html.

Appendix C: Interview Forms

Tri-City Disposal Co. Superfund Site **Five-Year Review Interview Form**

Site Name: Tri-City Disposal Co. **EPA ID No.:** KYD981028350
Interviewer Name: First Name Last Name **Affiliation:** Skeo Solutions/ EPA / Other Name
Subject Name: Wesley Turner **Affiliation:** Kentucky Superfund Branch
Subject Contact Information: wesley.turner@ky.gov
Time: 8:05 A.M. **Date:** 10/16/2012
Interview Location: email form
Interview Format (circle one): In Person Phone Mail Other: e-mail

Interview Category: State Agency

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   All activities are going as planned. The remediation system and conditions are appropriate for the Site.

2. What is your assessment of the current performance of the remedy in place at the Site?

   Performing very well,

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   There were some issues with three of the residents concerning the placement of environmental covenants on their parcels but with additional data collected by the PRPs, it was determined that a ground water use restriction was not needed for the Site.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   Conducted a couple of site visits to inspect the cap and surrounding area but no action was needed.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

All institutional controls are in place and protective of human health and the environment based on all data submitted to date.

7. Are you aware of any changes in projected land use(s) at the Site?

   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   The PRPs for the Site have been extremely cooperative and responsive to any requests for additional actions or information.

Tri-City Disposal Co. Superfund Site **Five-Year Review Interview Form**

Site Name: Tri-City Disposal Co. **EPA ID No.:** KYD981028350
Interviewer Name: Lynette Wysocki **Affiliation:** Skeo Solutions
Subject Name: Jim Forney **Affiliation:** Waste Management
Subject Contact Information: 517-381-0177; jforney@wm.com
Time: 08:30 A.M. **Date:** 1/18/2013
Interview Location: N/A

Interview Format: In Person Phone Mail Other:

Interview Category: Potentially Responsible Parties (PRPs)

1. What is your overall impression of the remedial activities at the Site?

   I think that the activities at going well as demonstrated by the ESD, reduction in monitoring and the ability to end treatment.

2. What have been the effects of the Site on the surrounding community, if any?

   At this stage, there has been limited effect. I think there was more of an effect during the 1980s when the removal took place.

3. What is your assessment of the current performance of the remedy in place at the Site?

   I think it is performing very well.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   No.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might the EPA convey site-related information in the future?

   Yes, I feel in the loop about the Site.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   No. I feel that things at the site are going fine. I would like to see the Site move toward delisting by the Agency.

Five Year Review – 2013
Tri-City Disposal Site, Shepherdsville, Bullitt County, Kentucky
Community Interviews

Community interviews were conducted, by telephone, as part of the Five Year Review for the Tri-City Disposal Site located in Shepherdsville, Bullitt County, Kentucky. All individuals that were interviewed were notified that the Five Year Review was being conducted at the Site and that the final report will be placed in the information repository located at the Ridgeway Memorial Library, 127 N. Walnut Street, Shepherdsville, Kentucky 40165, for the public to review.

This is the fourth Five Year Review of the site and most of the citizens that were residing in this area during the cleanup are now deceased or are residing in nursing homes. Several comments and concerns were recorded from the interviews:

- Do not feel that the Site was cleaned up properly.
- Some residents feel that everyone should have been bought out.
- During the cleanup, one resident had to pay out of pocket to fix his yard because of the damage that was done.
- Some residents stated that they wish it would have been cleaned up a little better.
- One resident stated that he was very aware of the Site, as well as the cleanup, but really does not think about it anymore and said the neighbors do not discuss it anymore.

Interviews were also conducted with City officials in Shepherdsville, Kentucky. They stated that they have not received any calls, complaints or concerns about the Tri-City Disposal Site.

Community Interviews were conducted by:
Angela R. Miller, Public Affairs Specialist
United States Environmental Protection Agency

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Tri-City Disposal Co.	**Date of Inspection: 9/19/2012**
Location and Region: Brooks, KY; Region 4	**EPA ID: KYD981028350**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Sunny/50F**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Ground water pump and treatment (no longer in use but remains on site)
- ☐ Surface water collection and treatment
- ☐ Other: _____
- ☐ Monitored natural attenuation
- ☐ Ground water containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** _____ Name _____ Title mm/dd/yyyy Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ Name _____ Title mm/dd/yyyy Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency State of Kentucky Superfund Branch
   Contact Wesley Turner (Name) _____ (Title) _____ (Date) wesley.turner@ky.gov (Phone No.)
   Problems/suggestions ☐ Report attached: Appendix C

   Agency _____
   Contact _____Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached:_____

4. **Other Interviews** (optional) ☒ Report attached: See Appendix C

Jim Forney, Waste Management

Local Residents

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)				
1.	**O&M Documents**			
	☒ O&M manual	☐ Readily available	☐ Up to date	☐ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: The O&M Plan was not available and is currently being updated.			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
7.	**Ground Water Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
10.	**Daily Access/Security Logs**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
IV. O&M COSTS				

1. **O&M Organization**

☐ State in-house ☐ Contractor for state

☐ PRP in-house ☒ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	_____ Total cost	☐ Breakdown attached
From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	_____ Total cost	☐ Breakdown attached
From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	_____ Total cost	☐ Breakdown attached
From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	_____ Total cost	☐ Breakdown attached
From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	_____ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Fencing and barbed wire around the impacted goat pasture was intact and in good condition.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Superfund site warning signs present on ground water treatment building and fencing surrounding the impacted goat pasture area.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): Sampling of MW2, MW4, Cox Spring and Unnamed Spring #1.

Frequency: Twice annually (March and September)

Responsible party/agency: American Environmental Group (O&M Contractor for PRP)

Contact	Bob Jameson	_____	mm/dd/yyyy	_____
	Name	Title	Date	Phone no.

Reporting is up to date	☐ Yes	☐ No	☒ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☒ N/A
Specific requirements in deed or decision documents have been met	☒ Yes	☐ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☒ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: Ground water, spring water, construction and land use restrictions have been placed on nine properties.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: Soil disturbances between the Dennis Cox residence and the newly constructed barn were observed. It appeared that a water line extension and hand pump were installed. The line seemed to connect to the Dennis Cox residence.

3. **Land Use Changes Off Site** ☐ N/A

Remarks: None

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: There are two gravel roads, both of which appeared to be in good condition. During the work in 2012, the road that provides access to the site pump house was improved.

B. Other Site Conditions

Remarks: The Site is in a rural residential area. Goats and horses occupied the impacted goat pasture area of the Site.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1.	**Settlement** (low spots)	☐ Location shown on site map	☒ Settlement not evident
	Arial extent: _____		Depth: _____
	Remarks: The impacted goat pasture area naturally slopes downward into the ravine where Unnamed Spring #1 is located. Work was completed on the area in June 2012 to improve the cover in the pasture area.		
2.	**Cracks**	☐ Location shown on site map	☒ Cracking not evident
	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: Vegetation covers the impacted goat pasture area. Erosion control fencing and rip rap have been placed on the sloping portion of the area.		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☒ Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: Grass and vegetation cover the impacted goat pasture area.		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☒ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Arial extent: _____		
	Remarks: The slope of the ravine down to the location of Unnamed Spring #1 is naturally very steep and prohibited inspection of the spring.However, this area was inspected, cleaned up and improved during site work in 2012.		

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
   Remarks: _____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
   Remarks: _____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
   Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement
   Arial extent: _____ Depth: _____
   Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
   Material type:_____ Arial extent: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
   Arial extent: _____ Depth: _____
   Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
   Arial extent: _____ Depth: _____
   Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions
   ☐ Location shown on site map Arial extent: _____
   Size: _____
   Remarks: _____

6. **Excessive Vegetative Growth** Type: _____
   ☐ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on site map Arial extent: _____
   Remarks: _____

D. Cover Penetrations ☒ Applicable ☐ N/A

1.	**Gas Vents**	☐ Active	☐ Passive	
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled	☐ Good condition
	☐ Evidence of leakage at penetration	☐ Needs maintenance	☒ N/A	
	Remarks: _____			
2.	**Gas Monitoring Probes**			
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled	☐ Good condition
	☐ Evidence of leakage at penetration	☐ Needs maintenance	☒ N/A	
	Remarks: _____			
3.	**Monitoring Wells** (within surface area of landfill)			
	☒ Properly secured/locked	☒ Functioning	☒ Routinely sampled	☒ Good condition
	☐ Evidence of leakage at penetration	☐ Needs maintenance	☐ N/A	
	Remarks: MW2 and MW4 were both secured and in good condition.			
4.	**Extraction Wells Leachate**			
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled	☐ Good condition
	☐ Evidence of leakage at penetration	☐ Needs maintenance	☒ N/A	
	Remarks: _____			
5.	**Settlement Monuments**	☐ Located	☐ Routinely surveyed	☒ N/A
	Remarks: _____			
E. Gas Collection and Treatment		☐ Applicable	☒ N/A	
1.	**Gas Treatment Facilities**			
	☐ Flaring	☐ Thermal destruction	☐ Collection for reuse	
	☐ Good condition	☐ Needs maintenance		
	Remarks: _____			
2.	**Gas Collection Wells, Manifolds and Piping**			
	☐ Good condition	☐ Needs maintenance		
	Remarks: _____			
3.	**Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)			
	☐ Good condition	☐ Needs maintenance	☐ N/A	
	Remarks: _____			
F. Cover Drainage Layer		☐ Applicable	☒ N/A	
1.	**Outlet Pipes Inspected**	☐ Functioning	☐ N/A	
	Remarks: _____			
2.	**Outlet Rock Inspected**	☐ Functioning	☐ N/A	
	Remarks: _____			
G. Detention/Sedimentation Ponds		☐ Applicable	☒ N/A	

1.	**Siltation**	Area extent: _____	Depth: _____	☐ N/A
	☐ Siltation not evident			
	Remarks: _____			
2.	**Erosion**	Area extent: _____	Depth: _____	
	☐ Erosion not evident			
	Remarks: _____			
3.	**Outlet Works**	☐ Functioning		☐ N/A
	Remarks: _____			
4.	**Dam**	☐ Functioning		☐ N/A
	Remarks: _____			
H. Retaining Walls		☐ Applicable	☒ N/A	
1.	**Deformations**	☐ Location shown on site map		☐ Deformation not evident
	Horizontal displacement: _____		Vertical displacement: _____	
	Rotational displacement: _____			
	Remarks: _____			
2.	**Degradation**	☐ Location shown on site map		☐ Degradation not evident
	Remarks: _____			
I. Perimeter Ditches/Off-Site Discharge		☐ Applicable	☒ N/A	
1.	**Siltation**	☐ Location shown on site map		☐ Siltation not evident
	Area extent: _____			Depth: _____
	Remarks: _____			
2.	**Vegetative Growth**	☐ Location shown on site map		☐ N/A
	☐ Vegetation does not impede flow			
	Area extent: _____			Type: _____
	Remarks: _____			
3.	**Erosion**	☐ Location shown on site map		☐ Erosion not evident
	Area extent: _____			Depth: _____
	Remarks: _____			
4.	**Discharge Structure**	☐ Functioning		☐ N/A
	Remarks: _____			
VIII. VERTICAL BARRIER WALLS		☐ Applicable	☒ N/A	
1.	**Settlement**	☐ Location shown on site map		☐ Settlement not evident
	Area extent: _____			Depth: _____
	Remarks: _____			

2. **Performance Monitoring** Type of monitoring: _____

☐ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Ground Water Extraction Wells, Pumps and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☒ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: Ground water treatment ended as part of the 2012 ESD. However, the ground water treatment building remains on site. It is locked and in good condition.

2. ***Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances***

☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. ***Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances***

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: The ground water treatment building remains on site but is no longer in operation.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☒ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: Monitoring only continues at MW2 and MW4 since the end of ground water treatment per the 2012 ESD.

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

Remarks: Some concentrations have fluctuated. See five year review report for details.

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: Monitoring continues only at MW2 and MW4 since the end of ground water treatment per the 2012 ESD.

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

The 2012 ESD did not require ground water restrictions on three properties at the Site, ended ground water treatment and required monitoring of ground water and spring water. The remedy appears to be functioning as designed. Ground water, spring water and land use restrictions have been removed and/or put into place at the Site as necessary. Ground water treatment has ended but monitoring is ongoing on an annual basis for MW2 and MW4 and on a semi-annual basis for Cox, Unnamed #1 and Klapper Springs.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The O&M contractor continues to implement O&M activities in a consistent manner. The O&M contractor has not noted any problems at the Site.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

There are no indications of problems with O&M activities at the Site.

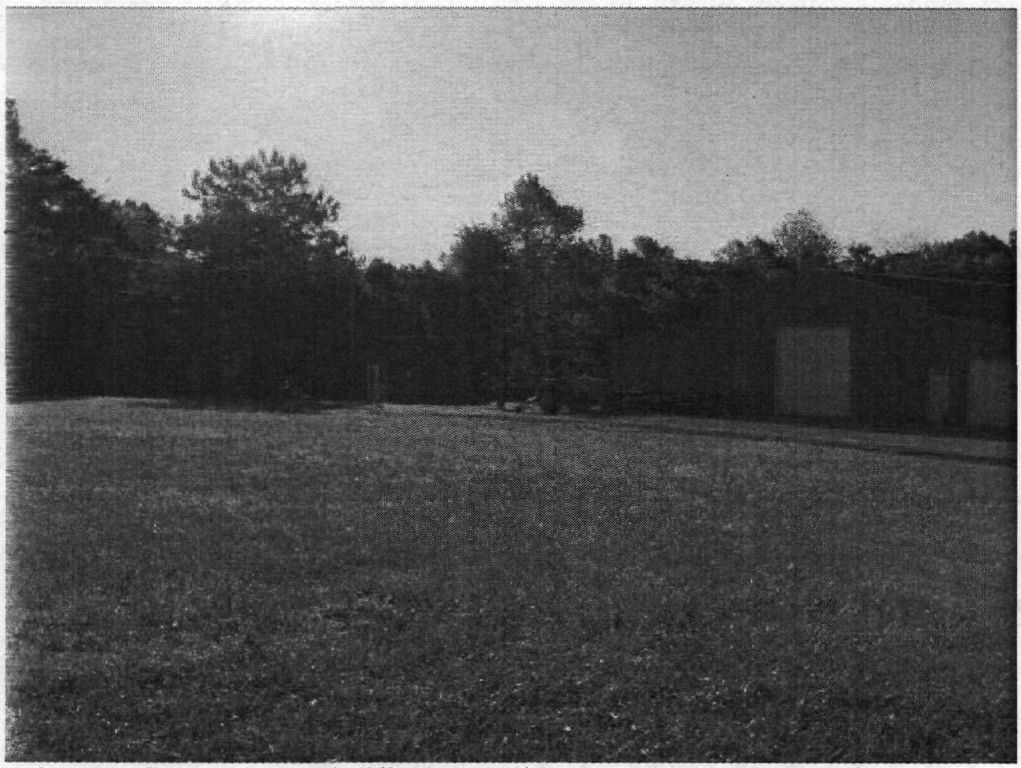
D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

There do not seem to be any opportunities for optimization at the Site.

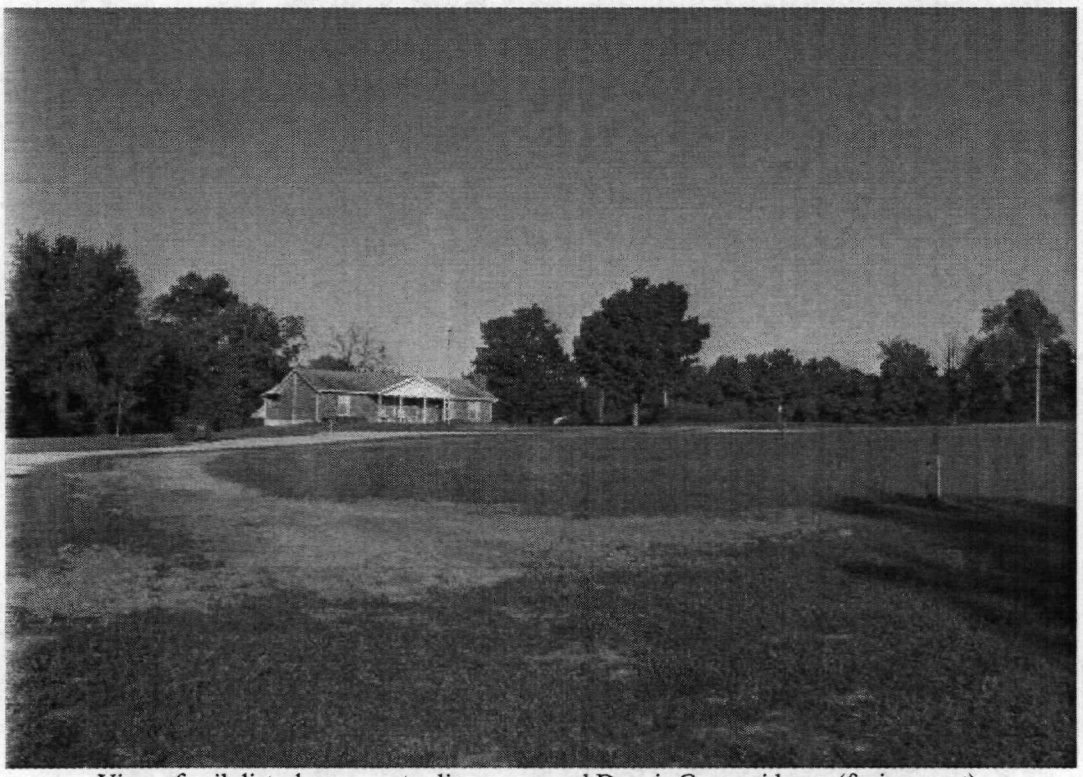
Site Inspection Participants:
Bill Joyner, EPA
Jim Forney, Waste Management
Scott Johnson, Conliffe, Sandmann & Sullivan
Bob Jameson, American Environmental Group
Treat Suomi, Skeo Solutions
Lynette Wysocki, Skeo Solutions

Appendix E: Photographs from Site Inspection Visit



Inactive ground water treatment building and new barn on Dennis Cox property (facing southeast).

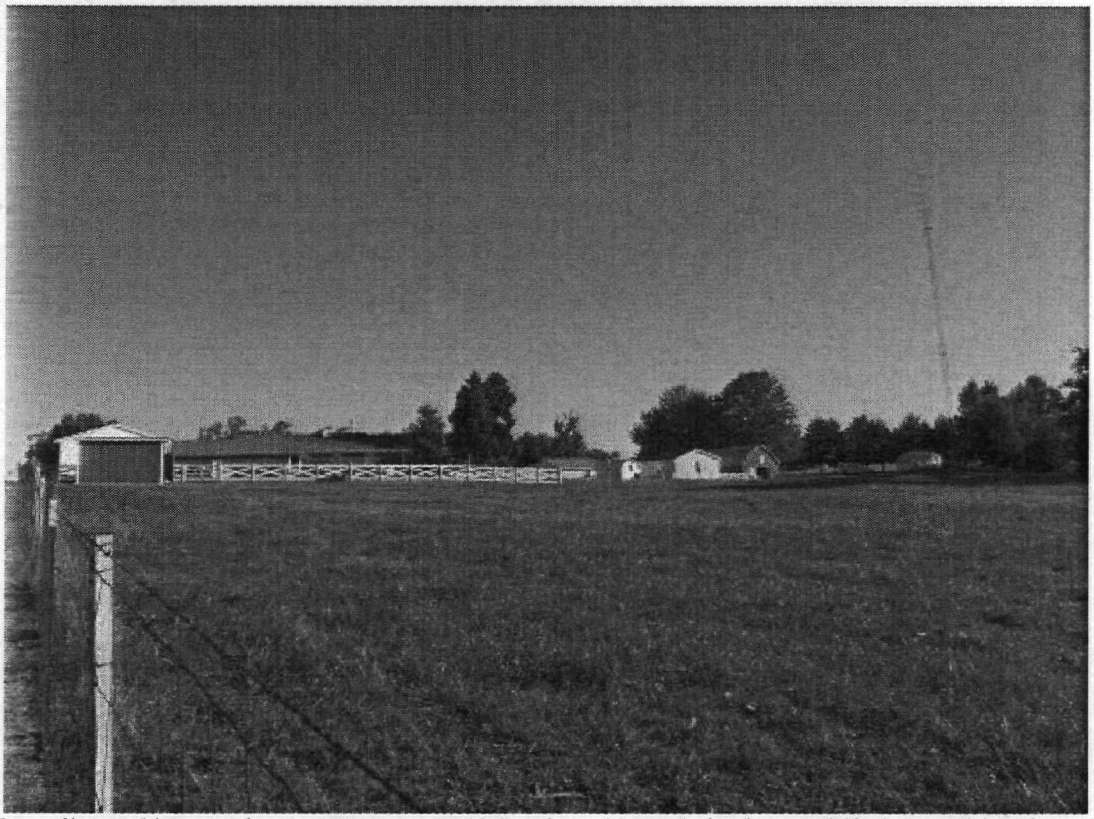
Disturbed soil and newly constructed water line and pump located near new barn (facing northeast).



View of soil disturbance, water line pump and Dennis Cox residence (facing west).

Disturbed soil leading to the side of the Dennis Cox residence.

View of impacted goat pasture area, fence and Superfund site warning sign (facing northeast).



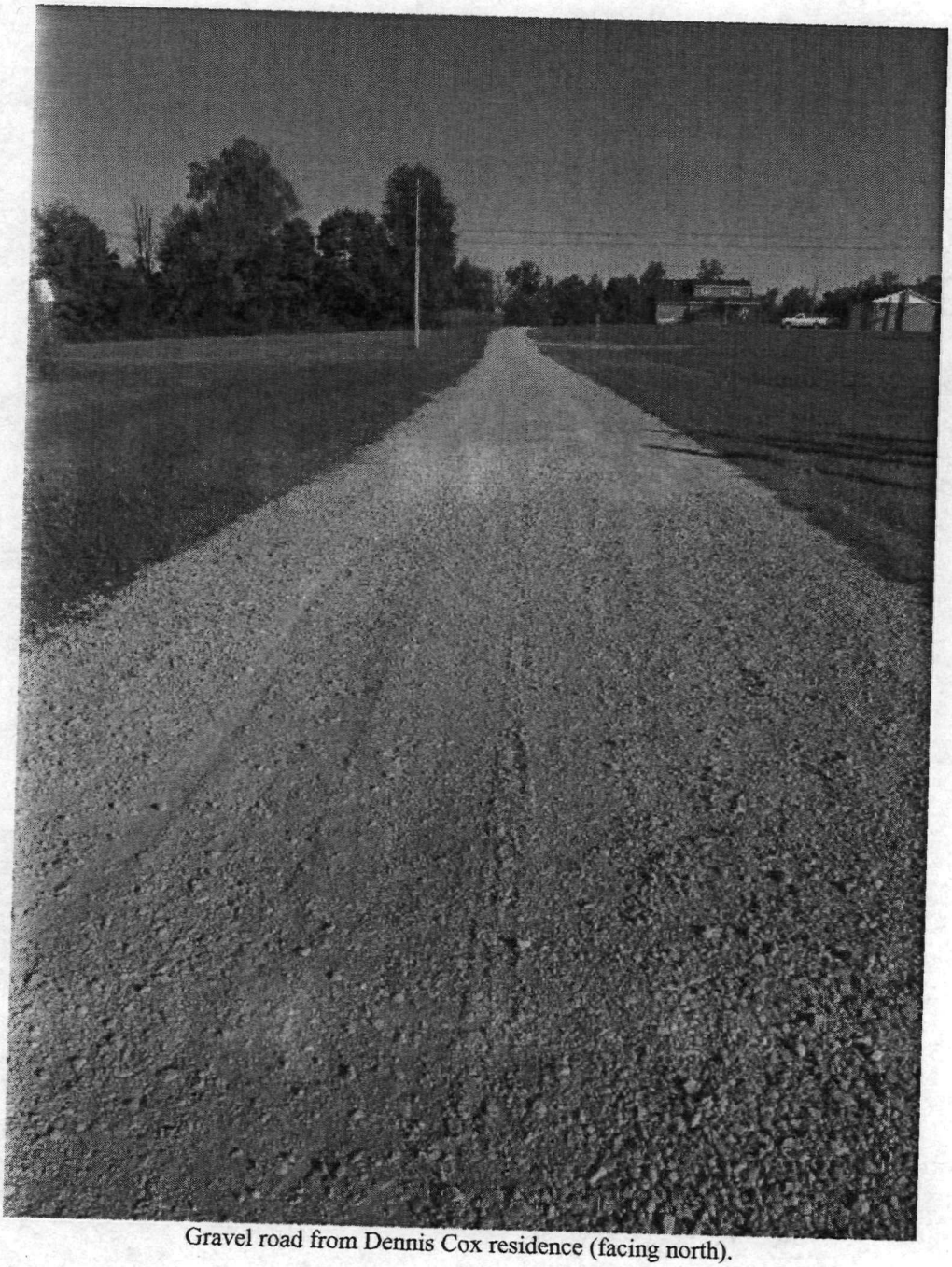
Fence line and impacted goat pasture area with Leedy residence in background (facing north/northeast).

MW 4, located near the new water line installation and new barn.

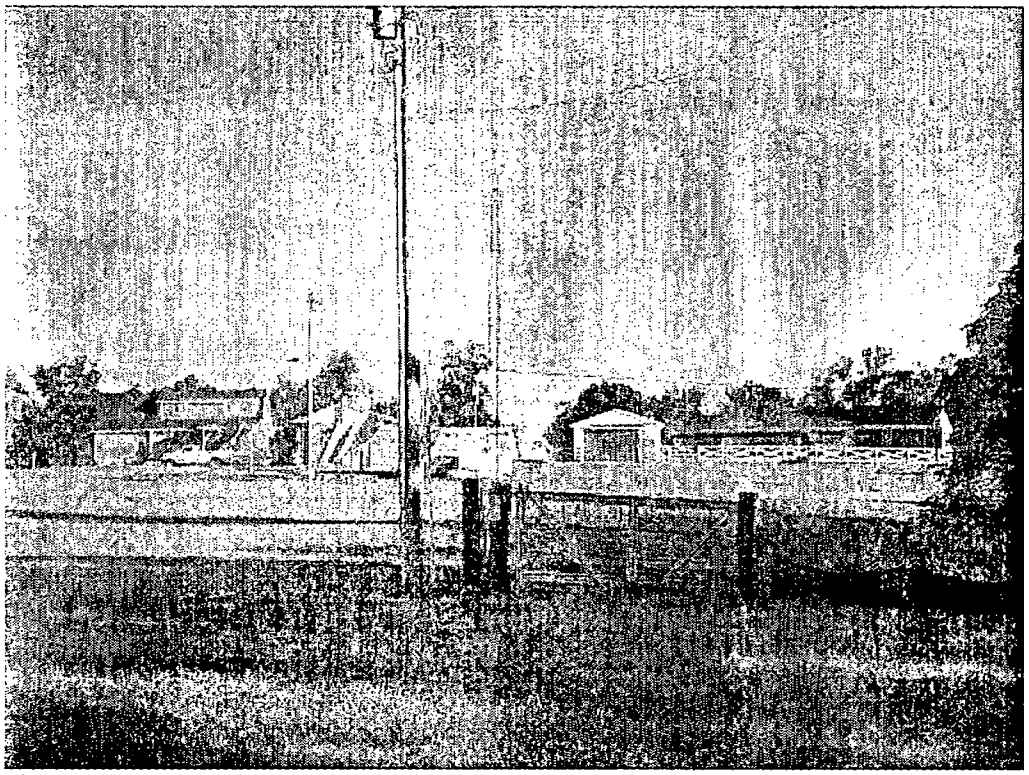
MW 2, located within the impacted goat pasture area.

Sloping area from the impacted goat pasture area toward the ravine where Unnamed Spring #1 is located.

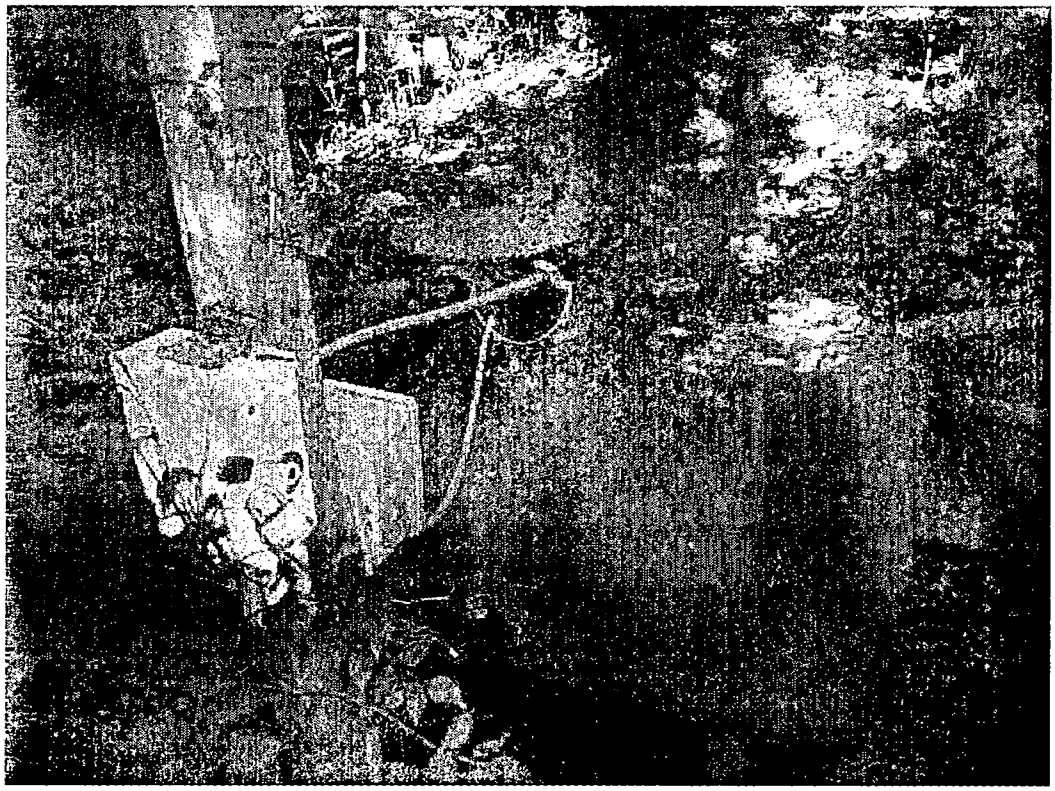
Fencing and ravine near Unnamed Spring #1.



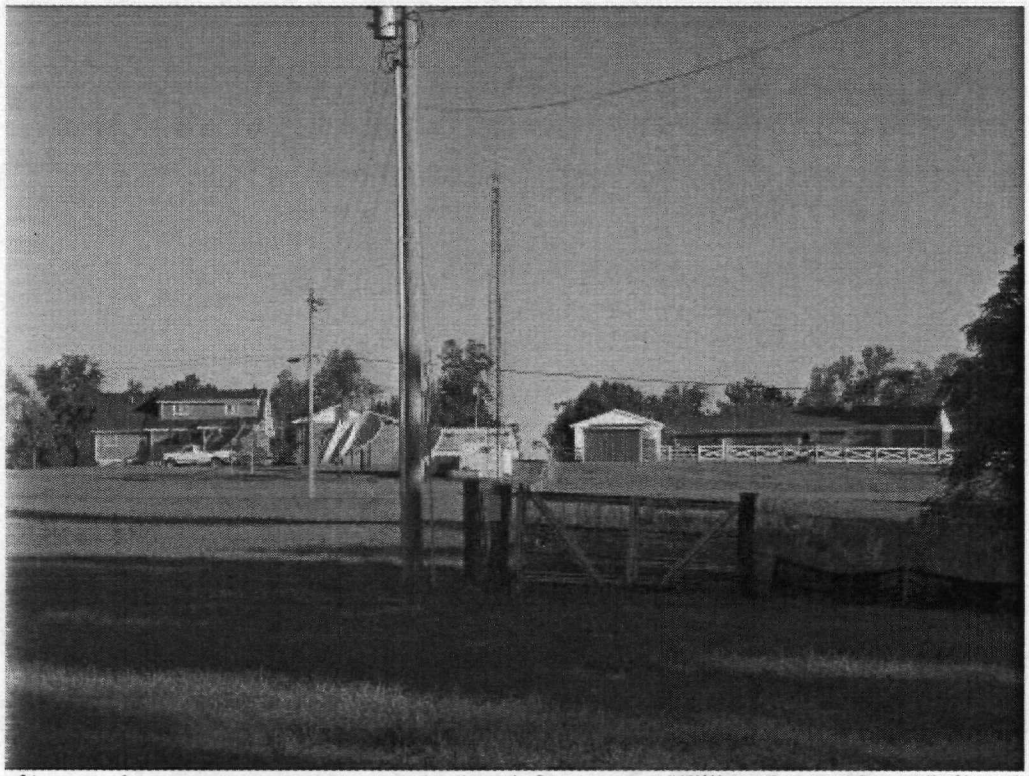
Gravel road from Dennis Cox residence (facing north).



View of impacted goat pasture area, communications infrastructure. William Cox residence (left) and Leedy residence (right), facing north.

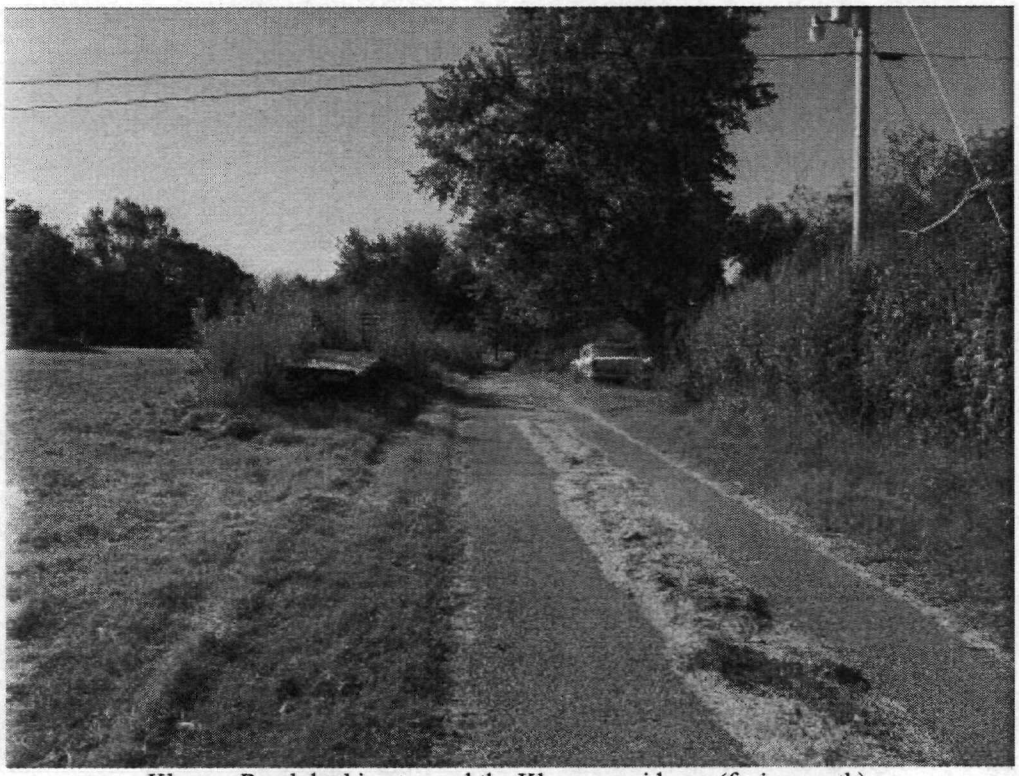


Cox Spring pumping station.

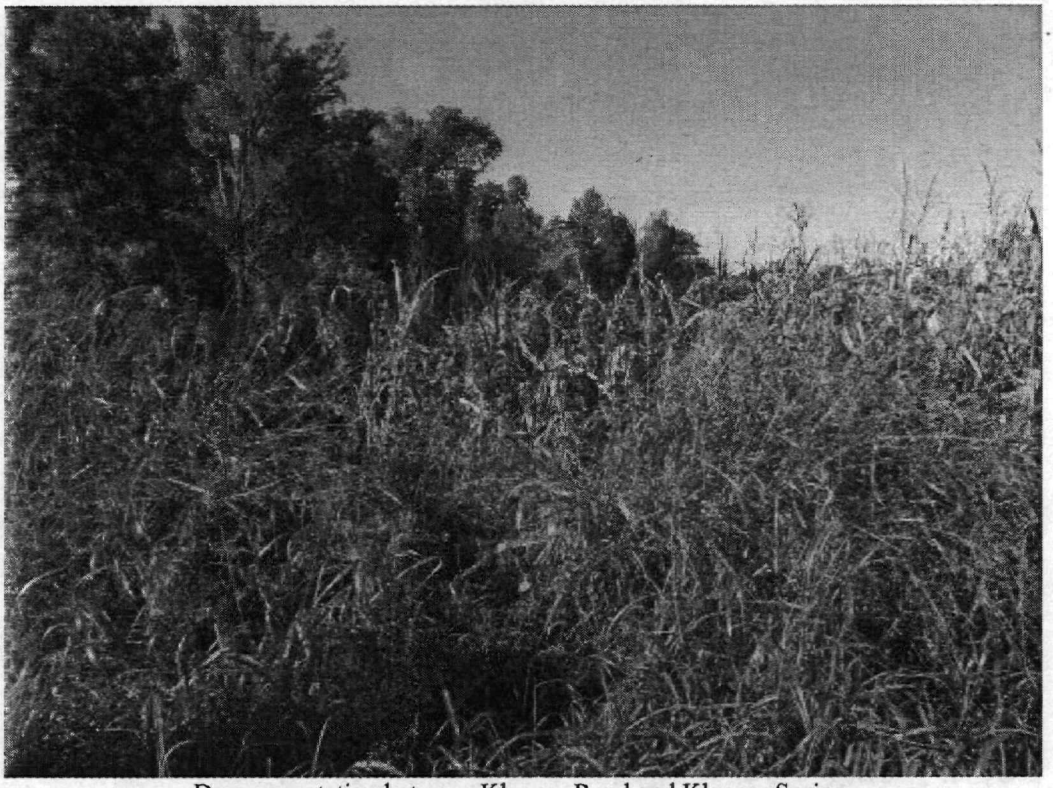


View of impacted goat pasture area, communications infrastructure, William Cox residence (left) and Leedy residence (right), facing north.

Cox Spring pumping station.



Klapper Road, looking toward the Klapper residence (facing south).



Dense vegetation between Klapper Road and Klapper Spring.

Appendix F: Toxicity Data

This appendix provides additional detail to support the evaluation of Question B of the technical assessment. Toxicity factors for some of the contaminants of potential concern have changed since the risk assessments conducted in 1990[2] and 2008[3]. As shown in Table F-1, most of the toxicity values for evaluating cancer risks, oral cancer slope factors (CSFs) and inhalation unit risk factors (IURs) have not changed since the risk assessments were completed in 1990 and 2008. However, for several chemicals, the CSFs and IURs either decreased or increased.

A decrease in a CSF or IUR indicates that the cancer potency has decreased, which would result in a lower risk than originally calculated. An increase in a CSF or IUR corresponds to an increase in the cancer risk, which would result in a higher risk than originally calculated. Similarly, most of the toxicity values for evaluating non-cancer effects, oral reference doses (RfDs) and inhalation reference concentrations (RfCs), have not changed. However, a decrease in a RfD or RfC corresponds to a more stringent value for evaluating non-cancer thresholds, while an increase in corresponds to a less stringent value. The impacts of changes in the toxicity values on the protectiveness of the remedies are addressed by evaluating ground water, soil and indoor air concentrations against health-based current screening levels, as discussed in more detail below.

The results of the focused risk assessment indicate that VOC emissions from the spring to ambient air do not result in risks outside of the NCP risk range of 10^{-6} to 10^{-4}. This determination was based on a comparison of modeled ambient air concentrations and the ambient air PRGs established by EPA Region 9 in 2004. Since 2008, the EPA has replaced the PRGs with the Agency's November 2012 RSLs. Based on a comparison of the modeled ambient air values to current RSLs, the risk conclusions did not change, as shown in Table F-2. Consequently, the selected remedy (e.g., termination of carbon treatment at Cox Spring and Unnamed Spring #1) remains protective.

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[2] Final Risk Assessment for the Final Remedial Investigation Report prepared by Ebasco, August 1990.

[3] Focused Risk Assessment of Potential Exposures to Volatile Organic Compounds Detected in Spring Water. Earth Tech. January 2008.

Table F-1. Toxicity Value Evaluation

Contaminants	Carcinogenic Toxicity Changes						Non-carcinogenic Toxicity Changes					
	Oral Cancer Slope Factor (CSF) (mg/kg-day)-1			Inhalation Unit Risk (IUR) ($\mu g/m^3$)-1			Oral Reference Dose (RfD) (mg/kg-d)			Inhalation Reference Concentration (RfC) (mg/m^3)		
	HRA 1990 and ESD 2012 Value[a]	Current Value[b]	Change	HRA 1990 and ESD 2012 Value[a,c]	Current Value[b]	Change	HRA 1990 and ESD 2012 Value [a]	Current Value[b]	Change	HRA 1990 and ESD 2012 Value[a,c]	Current Value[b]	Change
Metals												
Barium	ND	ND	None	ND	ND	None	5.0E-02	2.0E-01	Higher	3.5E-04	5.0E-04	Higher
Beryllium	ND	ND	None	2.4E-03	2.4E-03	None	5.0E-03	2.0E-03	Lower	ND	2.0E-05	New
Cadmium (water)	ND	ND	None	ND	1.8E-03	New	5.0E-04	5.0E-04	None	ND	ND	None
Cadmium (food)	ND	ND	None	1.8E-03	1.8E-03	None	1.0E-03	1.0E-03	None	ND	2.0E-05	New
Chromium VI	ND	ND	None	1.2E-02	1.2E-02	None	3.0E-03	3.0E-03	None	1.0E-04	1.0E-04	None
Chromium III	ND	ND	None	ND	ND	None	1.5E+00	1.5E+00	None	ND	ND	None
Copper	ND	ND	None	ND	ND	None	3.7E-02	4.0E-02	Higher	ND	ND	None
Lead	ND	ND	None	ND	ND	None	ND	ND	None	ND	ND	None
Nickel	ND	ND	None	ND	2.6E-04	New	2.0E-02	2.0E-02	None	ND	9.0E-05	New
Vanadium	ND	ND	None	ND	ND	None	9.0E-03	5.0E-03	Lower	ND	ND	None
Zinc	ND	ND	None	ND	ND	None	2.0E-01	3.0E-01	Higher	ND	ND	None
Organic Compounds												
Chloroform	6.1E-03	3.1E-02	Higher	2.3E-05	2.3E-05	None	1.0E-02	1.0E-02	None	ND	9.8E-02	New
Dichloroethane, 1,1-	9.1E-02	5.7E-03	Lower	ND	1.6E-06	New	1.0E-01	2.0E-01	Higher	3.5E-01	ND	Withdrawn
Dichloroethene, cis-1,2-	ND	ND	None	ND	ND	None	2.0E-02	2E-03	Lower	ND	ND	None
Dioxin (TCDD)	1.5E+05	1.3E+05	Lower	4.3E+01	3.8E+01	Lower	ND	7.0E-10	New	ND	4.0E-08	New
Polychlorinated biphenyls (high-risk)	2.0E+00	2.0E+00	None	5.7E-04	5.7E-04	None	ND	ND	None	ND	ND	None
Tetrachloroethene (PCE)	5.4E-01	2.1E-03	Lower	5.9E-06	2.6E-07	Lower	1.0E-02	6.0E-03	Lower	3.5E-02	4.0E-02	Higher

Contaminants	Carcinogenic Toxicity Changes						Non-carcinogenic Toxicity Changes					
	Oral Cancer Slope Factor (CSF) (mg/kg-day)-1			Inhalation Unit Risk (IUR) ($\mu g/m^3$)-1			Oral Reference Dose (RfD) (mg/kg-d)			Inhalation Reference Concentration (RfC) (mg/m^3)		
	HRA 1990 and ESD 2012 Value[a]	Current Value[b]	Change	HRA 1990 and ESD 2012 Value[a,c]	Current Value[b]	Change	HRA 1990 and ESD 2012 Value [a]	Current Value[b]	Change	HRA 1990 and ESD 2012 Value[a,c]	Current Value[b]	Change
Toluene	ND	ND	None	ND	ND	None	3.0E-01	8.0E-02	Lower	7.0E+00	5.0E+00	Lower
Trichloroethane, 1,1,1-	ND	ND	None	ND	ND	None	3.0E-01	2.0E+00	Higher	3.2E-01	5.0E+00	Higher
Trichloroethene (TCE)	4.0E-02	4.6E-02	Higher	1.1E-04	4.1E-06	Lower	3.0E-04	5E-04	Higher	3.5E-02	2.0E-03	Lower
Vinyl chloride	1.5E+00	7.2E-01	Lower	8.8E-06	4.4E-06	Lower	3.0E-03	3.0E-03	None	1.0E-01	1.0E-01	None

Notes

a. Toxicity values from final risk assessment of the final remedial investigation prepared by Ebasco, August 1990, and as cited in the focused risk assessment included in the 2012 ESD.

b. Values available for comparison from the EPA's Integrated Risk Information System (IRIS; accessed http://www.epa.gov/IRIS, 10/03/12) and the EPA's November 2012 Regional Screening Table.

c. Inhalation Reference Doses are no longer used and were converted to RfC values as follows: RfD_{inh} x 70 kg/20m^3.

d. Inhalation cancer slope factors are no longer used and were converted to IUR values as follows: CSF_{inh} x 20 m^3/70 kg x 0.001 kg/µg.

e. New = New value (previously no toxicity value was available)

f. ND = Not determined

Table F-2. Comparison of the Annual Average Ambient Concentration from Spring Air to EPA RSLs

Chemical	Annual Average Ambient Concentration ($\mu g/m^3$)[a]	Residential Regional Screening Level ($\mu g/m^3$)[b]	Equivalent Risk[c]
cis-DCE	1.772	NA[d]	NA
Tetrachloroethene	5.635	9.4	6E-07
Trichloroethene	1.366	0.43	3E-06
Vinyl chloride	0.050	0.16	3E-07
Total Risk			4E-06

Notes

a. Concentration from Appendix B-1 of 2012 ESD, Table 6-4 2008 Focused Risk Assessment.
b. EPA RSLs, November 2012 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm) associated with a 1E-06 cancer risk.
c. Calculated by multiplying the ambient concentration by a target risk level of 1E-06 and dividing by the RSL.
d. NA = not applicable; the chemical does not have toxicity values for inhalation exposure.

Since the 1991 ROD, the ground water cleanup goal for THM, including chloroform, changed from 100 µg/L to 80 µg/L. However, the lower goal does not affect the protectiveness of the selected remedy for ground water or spring water because the monitoring data collected between 2007 and 2011 indicate that chloroform is below detection or well below the MCL. Further, although exposure assumptions have not changed since the 1990 and 2008 risk assessments, new risk assessment methods enable the evaluation of potential vapor intrusion into occupiable structures from subsurface sources of VOCs. Consequently, the 2008 FYR identified the vapor intrusion exposure pathway as an area that may require further screening since VOCs are present in subsurface soils and ground water located underneath the residence on site.

A vapor intrusion study in July 2009 addressed the EPA's concern regarding this exposure pathway. This study involved the collection of two soil gas samples adjacent to the residence (Cox Sr.) where drums containing chlorinated solvents had been excavated. The results of this study indicated that none of the site-related VOCs were detected in the samples. Based on a review of this study, the EPA concluded in August 2009 that vapor intrusion is not an issue for this residence and there is not an impact from the Site.

Since the vapor intrusion study was conducted in 2009, the EPA currently recommends the use of multiple lines of evidence to evaluate the vapor intrusion pathway. Vapor migration from the subsurface to indoor air often is influenced by many variables, including the geology and hydrogeology of a site, building characteristics and seasonal changes. Although a second round of soil vapor was not collected for direct comparisons to the previous vapor intrusion study in 2009, other lines of evidence were evaluated to determine if the vapor intrusion exposure pathway remains of no concern:

- Using the EPA's VISL calculator for evaluating current ground water contamination near the residence.

- Evaluating the historical trends of VOC concentrations in ground water in 2009 near the Cox Sr. residence with current ground water data.
- Evaluating historical remediation activities conducted at the site.

To evaluate the most current subsurface conditions and potential impacts to the vapor intrusion exposure pathway, the maximum concentrations observed in the upper aquifer zone from the most recent ground water data from long-term monitoring were compared to the EPA's VISLs for ground water. As discussed in Section 4.1, six monitoring wells were identified for long-term monitoring as part of the remedy for assessing contamination in the different aquifer zones at the site. As of 2004, four of the six monitoring wells (MW-5, MW-8, MW-11, and MW-12) no longer required long-term monitoring and were abandoned because the wells achieved the MCLs. The only remaining wells included in long-term monitoring for the Site are MW-2 and MW-4 due to detections exceeding the MCLs. These wells were selected for comparison to the VISLs because both wells monitor the shallow aquifer zone, namely the overburden, are screened across the water table and the wells also are the closest to the residence (Cox Sr.) where the 2009 vapor intrusion study occurred. MW-2 is screened in the Harrodsburg and the Muldraugh formations in the overburden [well depth is 74.9 feet and screened between 35 and 50 feet below land surface (ft bls) where the water level is about 47.5 ft bls] while MW-4, the well closest to the residence, is screened in the Muldraugh formation of the overburden (well depth 60 ft, screened from 40 to 60 ft bls with a water level at about 49.5 ft bls).

VISLs are conservative screening levels that are calculated from target indoor air concentrations using empirically based conservative "generic" attenuation factors that reflect worst-case conditions and do not take into account any site-specific conditions such as site soil strata, depth to water table, and building properties that may reduce the transport of vapors from ground water through the soil column.

As shown in Table F-3, PCE and TCE were detected in ground water in September 2011 above the default VISLs for residential exposure. However, the VISLs are based on a 1E-06 risk. Thus, by entering the detected concentrations of 26 µg/L for PCE and 3.8 µg/L for TCE into the VISL calculator, the residential indoor vapor intrusion risk is calculated to be 2E-06 and 4E-06, respectively. Collectively, the total vapor intrusion risk from ground water is 6E-06 based on the September 2011 long-term monitoring data from monitoring wells MW-2 and MW-4. This risk is well within the risk range of 1E-06 to 1E-04 established under the NCP. Further, the ground water concentrations of PCE and TCE have declined since 2009 as depicted in Figures 5 and 6 of Section 4.1 for MW-2 and MW-4, respectively. This finding provides further support for the conclusion that the risks will continue to decrease with time, since the source of the contamination in this area (e.g., solvent drums) has been addressed.

Although a VISL is not available for cis-DCE, as inhalation toxicity values have not been established for this compound, cis-DCE is not classified as a carcinogen, and thus would not contribute to the cancer risk. Further, the detected concentration of cis-DCE of 3.6 µg/L is well below the MCL for this compound.

In addition to the vapor intrusion risk evaluation conducted in 2009, the following lines of evidence support that the remedy continues to be protective for vapor intrusion at the Site:

- The additional evaluation of current ground water concentrations in the VISL calculator using ground water data from over burden wells screened across the water table.
- Observations that PCE and TCE continue to decline in concentration since 2009 due to the removal of source material.

Table F-3. Comparison of Long-term Ground Water Monitoring Results with VISLs

Chemical	Maximum Detection in 2011 (µg/L)[a]	Residential Regional Vapor Intrusion Screening Level (µg/L)[b]	Equivalent Risk[d]
cis-DCE	3.6 (MW-4)	70[c]	NA[e]
Tetrachloroethene	26 (MW-2)	13	2E-06
Trichloroethene	3.8 (MW-4)	1.1	4E-06
Total Risk			6E-06

Notes

a. Maximum concentration Table 4 of the Quarterly Progress Report No. 123, Third Quarter, 2011.
b. EPA Vapor Intrusion Screening Level Calculator. May 2012 (http://www.epa.gov/oswer/vaporintrusion/documents/VISL_Calculator_v2_0_May_2012_RSLs.xlsm) based on a target cancer risk level of 1E-06.
c. MCL established under the National Primary Drinking Water Standards (40 CFR Part 141) available at http://water.epa.gov/drink/contaminants/index.cfm.
d. Calculated by multiplying the ground water concentration by 1E-06 and dividing by the VISL.
e. NA = not applicable since the screening level is based on an MCL which is not purely health-based.

The 1991 and 1996 RODs did not include standards for soil contaminants. However, during the 2003 FYR, KDEP raised the concern that residual contamination may still be present on site in the goat pasture and north of the treatment building based on the results of samples KDEP collected in these areas in 2001 and 2002. KDEP collected surface and subsurface soil samples (0 to 4 feet below ground surface, or ft bgs) from these areas and analyzed the samples for dioxins, furans, PCBs and metals. At the EPA's request, the PRPs compared KDEP's results to the risk-based concentration (RBC) tables developed by EPA Region 3. Based on this comparison, the PRPs determined that only one subsurface sample (TC5-D), collected at 3.5 to 4 ft bgs exceeded the EPA Region 3 RBCs for PCBs and lead. The EPA evaluated the data and concluded there was no threat posed by direct contact with surface soil at the Site since the only exceedances occurred at depth.

Although KDEP did not prepare a final report of the soil investigation that occurred in 2001 and 2002, a February 11, 2008 technical memorandum from contractor Earth Tech to PRP Waste Management indicated that KDEP informed the PRPs that the dioxin/furan

results from the surface soil did not represent a risk to area residents. In addition, KDEP indicated to the PRPs that there is contamination in the subsurface soil in the area of the former landfill that could result in risk to area residents if the overlying clean soil is disturbed. The 2008 FYR also evaluated the KDEP data by comparing the site data to the EPA's 2004 Region 9 PRGs, which were more current than the RBCs used previously.

Based on the 2008 FYR, lead and PCBs were identified as exceeding the PRGs at TC5-D at 3.5 to 4 ft bgs while PCBs were also above PRGs in samples TC1-D and TC2-D collected just outside the fence that runs along the eastern side of the goat pasture at a depth between 6 inches and 1 ft bgs. Although a PRG was available for dioxin and the dioxin levels in TC-5D exceed the residential PRG, dioxin was not identified as a COC in the 2008 FYR. The 2008 FYR concluded that there was no evidence of surface soil contamination. However, some subsurface samples contain lead and PCB concentrations that exceed PRGs, raising concerns that the subsurface soil contamination may require institutional controls to restrict excavation and construction on affected areas of the Site.

Since the 2008 FYR, the PRGs have been replaced by the EPA's RSLs for soil. The highest concentrations for each contaminant detected during the 2002 KDEP analyses are presented in Table F-4 to evaluate the protectiveness of the remedy for surface and subsurface soils based on more current toxicity values. The highest total dioxin value is also included, as it was not previously identified as a COC.

Table F-4. Comparison of Soil Data to Current Screening Levels

Contaminant	KDEP 2001/2002 Soil Sampling Results (mg/kg)	Region 9 2004 PRGs (mg/kg)	Residential November 2012 RSL (mg/kg)	Change
Barium	2,470	5,400	15,000	Less stringent
Cadmium	11.3	37	70	Less stringent
Chromium	200.	210	0.3[a] (Hexavalent chromium) 120,000 (Trivalent chromium)	More stringent Less stringent
Copper	94.1	3,100	3,100	None
Lead	1430	400	400	None
Total PCBs (combined Aroclors)	3.6	0.22	0.22	None
Dioxin[b]	574*	3.8*	4.5*	Less stringent

a. The EPA is currently evaluating whether hexavalent chromium is carcinogenic based on oral exposure. For screening purposes, the carcinogenic risk-based RSL was used to be conservative.
b. Dioxin concentrations are expressed as TEQ relative to 2,3,7,8-tetrachlorodibenzodioxin (TCDD). Dioxins were not identified as exceeding the 2004 PRGs in the 2008 FYR even though the maximum concentration in sample TC-5D exceeded the PRG.
* Values are presented in parts per trillion (ppt).

As shown in Table F-4, chromium (assuming hexavalent form), lead, PCBs (i.e., total aroclors) and 2,3,7,8-tetrachlorodibenzodioxin (TCDD), also referred to as dioxin, exceed the RSLs. Maximum lead, chromium and PCB concentrations were detected in sample TC5-D, which was collected between 3.5 and 4 ft bgs. Two other samples (TC1-D at 0.27 mg/kg and TC2-D at 0.23 mg/kg collected at 6 inches to 1 ft bgs) contained PCB concentrations greater than the RSLs for total PCBs. These two samples exceed the carcinogenic screening levels but would fall below levels corresponding to a cancer risk of 1E-05.

The 2002 KDEP soil evaluation only included the analysis of total chromium and did not differentiate whether the total chromium is composed of the more toxic hexavalent or less toxic trivalent chromium. Consequently, RBCs and PRGs based on total chromium were used for comparison purposes. The EPA has replaced the PRGs with RSLs and recommends the use of the RSL for the more toxic hexavalent form of chromium when evaluating sites where the valency of chromium is unknown. The RSL of 0.3 mg/kg is based on toxicological information reviewed by the New Jersey Department of Environmental Protection, which classifies hexavalent chromium as a carcinogen through oral exposure.[4] While the EPA is currently reviewing the draft toxicological assessment for hexavalent chromium, the use of the risk-based RSL for hexavalent chromium is recommended by the EPA when conducting screening evaluations of data.

The EPA anticipates that the hexavalent chromium reassessment for the Site will be updated during the next FYR. In the interim, the more conservative risk-based RSL for soil at 0.3 mg/kg is appropriate at the Site with some level of uncertainty of carcinogenicity of hexavalent chromium by the oral route of exposure. However, the RSL for the trivalent form of chromium (non-carcinogenic) at 1.2E+05 mg/kg is protective of the child receptor resulting in a Hazard Index of less than 1. Although the toxicity values have changed, there is no exposure pathway with the soil cover in place. Additionally, the selected remedy is not intended to meet risk-based clean-up levels. Therefore, changes in toxicity values for chromium would not affect the protectiveness of the remedy.

Dioxin sampling took place near residences in December 2001 and in the pasture in March 2002. Dioxin is the most potent of a series of related polychlorinated dibenzodioxins and polychlorinated dibenzofurans with each member of these chemical classes exhibiting similar toxicological effects but differing only in the degree of toxicity. As a result, each dioxin-like chemical is expressed as toxic equivalents of TCDD by using toxicity equivalency factors (TEFs) to convert the different dioxin-like compounds into an estimate of the total dioxin concentration expressed as dioxin TEQs. The TEFs were developed by the World Health Organization in 1998 and then revised in 2006[5]; two are lower, and two are higher. As a result, to determine the impact of the 2006 TEFs on

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[4] NJDEP, 2009. Derivation of Ingestion-Based Soil Remediation Criterion for Cr+6 Based on the NTP Chronic Bioassay Data for Sodium Dichromate Dihydrate. Stern, A. State of New Jersey, New Jersey Department of Environmental Protection. http://www.state.nj.us/dep/dsr/chromium/final_HexChromRAGuide.pdf

[5] Van den Berg, et al., 2006. *World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds*, Toxicological Sciences 93(2):223-241, 2006.

the dioxin TEQ concentration, the total dioxin concentrations calculated by KDEP have decreased based on more current TEFs. In addition, on February 17, 2012, the EPA released a new non-cancer RfD value for dioxin which results in a residential RSL of 50 parts per trillion (ppt) based on a non-cancer hazard index of 1.0. Using the new TEFs and RfD values, the historical data were reevaluated for protectiveness. For example, only one dioxin sample location, 5-TC-LY-1S, collected in 2001 resulted in a total dioxin TEQ concentration of 6.21 ppt, which exceeded the current risk-based RSL of 4.5 ppt (based on a 1E-06 risk). However, this level is below the level of 50 ppt which corresponds to a non-cancer hazard of 1 and below the dioxin background for the Site of 8 ppt. Further, adjusting this sample using the more current TEFs actually lowers the dioxin concentration from 6.21 ppt to 4.8 ppt. Dioxin was also detected above the RSL at several locations in the pasture in 2002: TC-1S, TC-1D, TC-2S, TC-2D,TC-3D, TC-5S and TC-5D.

Only three of the samples exceeded the background level: TC-2D at 13.3 ppt, TC-3D at 9.187 ppt and TC-5D at 574 ppt. Even if the more current TEFs were used to adjust these concentrations, the concentrations would still exceed background and the RSL. However, the soil cover included in the 2012 ESD ensures the protectiveness of human health and the environment. The cover addresses the exceedances of chromium, lead, PCBs and dioxins in the pasture and institutional controls are in place restricting disturbance of the capped area.